FP B740
MP C530
MP C545
MP C555
MP C560

SERVICE MANUAL

Canon

MultiPASS C530
MultiPASS C560

SERVICE MANUAL

REVISION 0

MultiPASS C530	H12-1592	120V	CCSI
MultiPASS C530	H12-1596	120V	CND/LTN
MultiPASS C560	H12-1582	120V	CCSI
MultiPASS C560	H12-1586	120V	CND/LTN

Canon

JULY 1999

HY8-19AN-000

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Application

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DTP System

This manual was produced on an Apple Macintosh® personal computer, final pages were printed on Canon SUPER LASER SHOT B406 PS.
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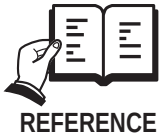
I. MEANING OF MARKS

The marks used in this manual have the following meanings.

Mark	Meaning
	States a precaution to be taken to prevent danger to personnel, damage to the product, or damage to electronic components by discharge of static electricity. for example.
	States a precaution to be taken to prevent damage to electronic components by electrostatic discharge.
	Informs you of fire-related cautions.
	Informs you that the plug must be removed from the power outlet before starting an operation.
NOTE	Gives useful information to understand descriptions.
 REFERENCE	Indicates sections to be read to obtain more detailed information.

II. ABOUT THIS MANUAL

This manual is divided into five parts, and contains information required for servicing the product.

Each of the above parts is further divided into the following four chapters:

Chapter 1: General Description

This part explains product specifications and the how to service the unit safely. It is very important, so please read it.

Chapter 2: Technical Reference

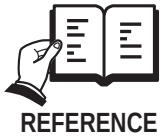
This part explains the technical theory of the product.

Chapter 3: Maintenance and Service

This part explains how to maintain the products for adjustment and troubleshooting and service operations and service switches.

Chapter 4: Appendix

This part explains the informations of the optional products and user data flow.



REFERENCE

- For more details of user operations and user reports, see the separate volume of *USER'S GUIDE*.
- Procedure for assembly/disassembly and greasing points are not given in this manual. See the illustrations in the separate volume of *PARTS CATALOG*.
- Detailed description of each SSSW/parameter is not given in this manual except the new SSSWs/parameters added to this model.
  See *G3 Facsimile Service Data Handbook (supplied separately)* for details them.
- See the *G3 Facsimile Error Code List (Rev.1, supplied separately)* for details of the error codes not shown in this manual.
- Detailed description of connector Locations and Signal Descriptions in not given in this manual.

See the *Circuit Diagram* for details them.

III. REVISION HISTORY

REVISION	*CONTENT*
0	Original

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1. FEATURES

1.1 Overview

This product is a G3 transreceiving facsimile based on the ITU-T recommendations. It can be used in telephone networks.

*: This mark indicates a new function.

Picture Quality Color Printer

High quality printing can be accomplished with the Canon Bubble Jet (BJ) method using the maximum 720dpi × 360dpi resolution. Various kinds of media can be printed with the high speed of a maximum 4.5 pages per minute. The printing paper tray can hold up to 100 sheets of plain paper, 50 sheets of OHP film, or 10 back print films or envelopes.

***Plain paper fax which can transmit/receive in color**

Conforming to ITU-T recommendations, this fax is able to transmit/receive in color. Due to containing extremely high-speed 14.4kbps (MultiPASS C530) / 33.6kbps (MultiPASS C560) modems, transmission time can be shortened. Pictures and photographs can both be send and received clearly by UHQ(Ultra High quality), Canon's vivid image processing technology. Up to 20 letter- or A4- size sheets, or up to 10 legal-size sheets, can be set in the ADF. 12 one-touch dial entries and 100 speed dial entries can be registered, and group dial and broadcasting transmission can also be done. When paper and ink run out, the data is saved to memory, so there is no worry. When a external-phone is attached, fax communication and normal telephone reception are possible due to DRPD service and FAX/TEL switching.

BJ Cartridge **See Page 2-18**

Printing quality superior to photos is produced by use of BC-20 and BC-21e/BC-22e BJ cartridges.

***Out-of-Ink Function** **See Page 2-18**

This machine has a function which detects when ink has run out. It also detects when the cartridges of machines equipped with color communications are out of ink. After printing each received page, the ink is ejected in front of a photo sensor in order to detect the presence/absence of remaining ink.

Copy Function

This machine can be used as a 360dpi × 360 dpi high resolution full color copier. With a monochrome document (including half-tone), up to 99 pages can be copied at one time at the speed of a maximum of 3 pages/minute.

Full Color & 256 Gradation Grayscale Scanner **See Page 2-33**

Using graphics or OCR software which conforms to the TWAIN standard, full color and 256-gradation grayscale images with a quality of 30dpi ~ 600 dpi can be read into a computer. Reading in can be done at a resolution of 300dpi, and can be enhanced to 600dpi using the included MultiPASS Desktop Manager.

PC Fax

By connecting this machine to a computer, a fax can be transmitted from the included MultiPASS Desktop Manager or from a Windows application, and a received image can be saved to the computer as-is without printing it out.

2. SPECIFICATIONS

2.1 General Specification

Type	Desktop
Body colour	Art gray
Power source	98 ~ 132V AC, 48 ~ 62 Hz,
Power consumption	standby 6.9 W (C560) 6.1 W (C530) Max. 37.9 W (when 100% black copy)
Usage environment.	50.0°F ~ 90.5°F (10°C ~ 32.5°C), 20%~85% RH, 532 ~ 760 mmHg (709 ~ 1013 hPa) Horizontal ±3° or less
Operating noise	Measured in accordance with ISO standards Operating :47 dB(A) or less
Dimensions (W × D × H)	14.41" × 12.76" × 8.19" (366 mm × 324 × 208 mm) (Not including Trays)
Weight	11.24 lbs (5.1 kg) Including trays

2.2 Communication Specification

Applicable lines		PSTN (Public Switched Telephone Network)
Applicable Services		DRPD (Distinctive Ring Pattern Detection)
Handset		None
Transmission method		Half-duplex
Transmission control protocol		ITU-T T30 binary protocol/ECM protocol/ ITU-T V.8 protocol/V.34 protocol/ECM protocol*
Modulation method		
G3 image signals		ITU-T V.27ter (2.4k, 4.8k bps) ITU-T V.29 (7.2k, 9.6k bps) ITU-T V.33 (12k, 14.4k bps) ITU-T V.17 (TC7.2k, TC9.6k, 12k, 14.4k bps) ITU-T V.34 (2.4k, 4.8k, 7.2k, 9.6k, 12k, 14.4k, 16.8k, 19.2k, 21.6k, 24k, 26.4k, 28.8k, 31.2k, 33.6k bps)*
G3 procedure signals		ITU-T V.21 (No.2) (300bps) ITU-T V.8 300bps* ITU-T V.34 600 bps, 1200 bps* (With automatic fallback function)
Coding	**Black/white**	ITU-T T.4 Coding method (MH, MR) ITU-T T.6 Coding method (MMR) ITU-T T.82/T.85 Coding method (JBIG)
	Color	ITU-T T.81 Coding method (JPEG)
Error correction		ITU-T T30 (ECM)
Canon express protocol (CEP)		None

* MultiPASS C560 only

Time required for transmission protocol

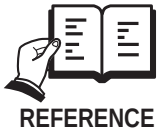
Protocol Mode	Pre-message Protocol *1	Post-message Protocol *2 (between pages)	Post-message *3 (after pages)
G3 standard	approx.18 sec.	approx.4 sec.	approx.4 sec.
V.8/V.34*4	approx.8 sec.	approx.2 sec.	approx.2 sec.

*1 Time from when other facsimile is connected to the line until image transmission begins.
*2 Post-message (between pages): Time from after one document has been sent until transmission of the next document starts if several pages are transmitted.
*3 Post-message (after last pages): Time from after image transmission is completed until line is switched from facsimile to telephone.
*4 MultiPASS C560 only

Minimum transmission time	10 msec (G3), 0 msec (G3, ECM)
Transmission output level	from 0 to -15 dBm
Receive input level	from -3 to -43 dBm
Modem IC	R288F-26 (MultiPASS C560) FM214 (MultiPASS C 530)

2.3 Color Communication Specification

ITU-T recommendation	ITU-T T.30 ANNEX E (JPEG Color Fax) T.4 ANNEX E (JPEG Header) T.42 (Color space for Color Fax) T.81 (JPEG)
Scanning Document size	A4
Printing paper size	A4
Resolution	200×200 dpi
Picture element	8 bit
Coding	JPEG
Color space	CIELAB
Illuminant Data	CIE Standard Illuminant D50
Sub sample	4:1:1 (=Lab)


REFERENCE

For details Color Communication, see *8.5 Color communication on page 2-69*.

2.4 Scanner Specification

Type	Sheets	
ADF capacity	Max. 20 sheets (A4/Letter)	
	Max. 10 sheets (Legal)	
Effective scanning width	Letter/Legal	8.42" (214 mm)
	A4	8.19" (208 mm)
Scanning method	Contact sensor scanning method	

Scanning line density & Scanning speed

Operation	Mode	Line density	Motor step interval	Scanning speed
FAX	Standard	8 dot/mm × 3.85 line/mm (203.2 dpi × 97.79 dpi)	150 dpi/step	5 msec/line (Direct TX) 3.3 msec/line (Memory TX)
	Fine	8 dot/mm × 7.7 line/mm (203.2 dpi × 195.58 dpi)	300 dpi/step	3.3 msec/line
Scanner	Text (Binary)	150 dpi or less	150 dpi/step	5 msec/line
		151~300 dpi	300 dpi/step	3.3 msec/line
		301~600 dpi	600 dpi/step	3.3 msec/line
	Gray scale	150 dpi or less	150 dpi/step	5 msec/line
		151~300 dpi	300 dpi/step	3.3 msec/line
		301~600 dpi	600 dpi/step	3.3 msec/line
	Full color	150 dpi or less	150 dpi/step	9.9 msec/line
		151~300 dpi	300 dpi/step	9.9 msec/line
		301~600 dpi	600 dpi/step	9.9 msec/line
Copy	B&W	360 dpi	600 dpi/step	3.3 msec/line
	Full color	360 dpi	600 dpi/step	9.9 msec/line

Scanner gradations	grayscale;	8 bit, 256 gradations
	color;	R,G,B (8 bits each) full color capability
TWAIN	Yes	
Scanning density adjustment	3 density level	
Image modes	Halftone (PHOTO mode)	
Halftone (fax and copy)	64-gradation error diffusion system (UHQ)	
Prescan	Yes	

Scanning range

Sheet dimensions (W × L)

Maximum	8.50" × 39.3" (216 mm × 1000 mm)
Minimum	3.5" × 1.75" (88.9 mm × 44.5 mm)
Thickness	
multiple pages:	0.003" ~ 0.005" (0.08 mm ~ 0.13 mm)
	75~90 g/m²
single page:	0.003" ~ 0.017" (0.08 mm ~ 0.43 mm)
	75~340 g/m²

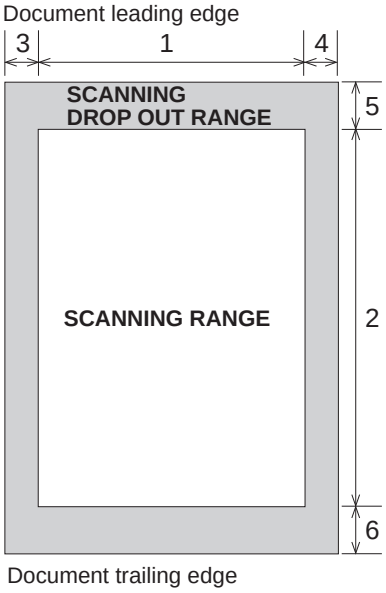


Figure 1-1 Scanning Range

Item	A4	Letter	Legal
1 Effective scanning width	8.09"~8.23" (205.5~209 mm)	8.31"~8.46" (211.0~215 mm)	8.31"~8.46" (211.0~215 mm)
2 Effective scanning length	11.54" (289~297 mm)	10.84" (271.4~279.4 mm)	13.84" (347.6~355.6 mm)
3 Left margin	0.04" ±0.14" (1.0 mm ±3.5 mm)	0.04" ±0.14" (1.0 mm ±3.5 mm)	0.04" ±0.14" (1.0 mm ±3.5 mm)
4 Right margin	0.04" ±0.14" (1.0 mm ±3.5 mm)	0.04" ±0.14" (1.0 mm ±3.5 mm)	0.04" ±0.14" (1.0 mm ±3.5 mm)
5 Top margin	0.08" ±0.08" (2.0 mm ±2.0 mm)	0.08" ±0.08" (2.0 mm ±2.0 mm)	0.08" ±0.08" (2.0 mm ±2.0 mm)
6 Bottom margin	0.08" ±0.08" (2.0 mm ±2.0 mm)	0.08" ±0.08" (2.0 mm ±2.0 mm)	0.08" ±0.08" (2.0 mm ±2.0 mm)

Units are inches with mm shown in parentheses.

NOTE

Document scanning width **"A4/LTR"** is set in service data #1 SSSW SW06, bit4.

2.5 Printer Specification

Printing method	Bubble-jet ink on-demand	
BJ Cartridge		
Products name	BC-20 Black BJ cartridge/BC-21e Color BJ cartridge/BC-22e Photo Color BJ cartridge	
Product code	F45-0561/F45-1301/F45-1311	
Print head	128 nozzles/136 nozzles (Y:24, M:24, C:24, Bk:64)/136 nozzles	
Ink cartridge (Ink tank)	None/BCI-21 Color or BCI-21 Black/None	
Storage conditions	Temperature	32.0°F ~ 95.0°F (0°C ~ 35°C)
	Humidity	35% ~ 85% RH
Ink Cartridge		
Products name	BCI-21 Black Ink Cartridge/BCI-21 Color Ink Cartridge	
Product code	F47-0731/F47-0741	
Ink contains	9 ml/5 ml each of YMC	
Ink detection	Interrupter Sense Black ink/Color ink (Detects separately)	
Printing speed	Black	Approx. 5 pages/minute (in case of character print)
	Color	Approx. 1 page/minute
Printing resolution	360 dpi × 360 dpi (Normal print)	
	180 dpi × 180 dpi (Economy print*)	
*Printing in a checkered pattern without printing vertical and horizontal adjacent dots.		
Paper output tray stacking	Approx. 50 sheets (when using the recommended paper)	
	Approx. 20 sheets (when raised output guides)	
Paper tray		
Paper supply method	ASF (Auto Sheet Feeder)	
Number of paper tray	1tray : Legal/Letter/A4 (Universal)	
Paper capacity	Max. 0.40" (10 mm) thickness	
	plain paper (Approx. 100 sheets)	
Recommended paper		
Canon Copier LTR/LGL Premium Paper		
Weight	75 g/m^2	
Paper size	Letter, Legal	
Manufactured by	BOISE CASCADE	
PLOVER BOND		
Weight	75 g/m^2, 90 g/m^2	
Paper size	Letter	
Manufactured by	FOX RIVER	
XEROX 4024		
Weight	75 g/m^2, 90 g/m^2	
Paper size	Letter, Legal	
Manufactured by	XEROX	

Printing range (Black & White FAX)

Paper dimensions (W × L)

Letter	8.50" × 10.98" (216 mm × 279 mm)
Legal	8.50" × 14.02" (216 mm × 356 mm)
A4	8.27" × 11.69" (210 mm × 297 mm)

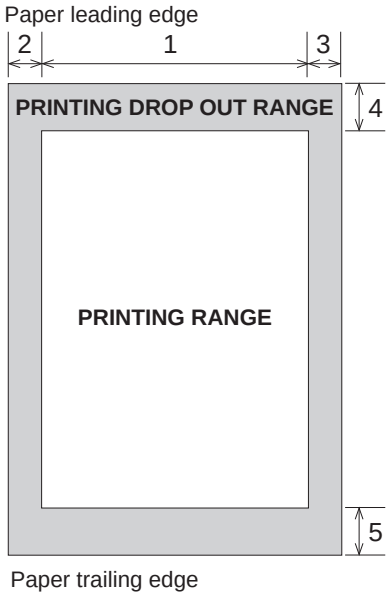


Figure 1-2 Printing Range

Item	A4	Letter	Legal
1 Effective printing width	8.00" (203.2 mm)	8.00" (203.2 mm)	8.00" (203.2 mm)
2 Left margin	0.13"±0.06" (3.4±1.5 mm)	0.25"±0.06" (6.4±1.5 mm)	0.25"±0.06" (6.4±1.5 mm)
3 Right margin	0.13"±0.06" (3.4±1.5 mm)	0.25"±0.06" (6.4±1.5 mm)	0.25"±0.06" (6.4±1.5 mm)
4 Top margin	0.12"±0.06" (3.0±1.5 mm)	0.12"±0.06" (3.0±1.5 mm)	0.12"±0.06" (3.0±1.5 mm)
5 Bottom margin	0.27"±0.12" (7.0±3.0 mm)	0.27"±0.12" (7.0±3.0 mm)	0.27"±0.12" (7.0±3.0 mm)

Units are inches with mm shown in parentheses.

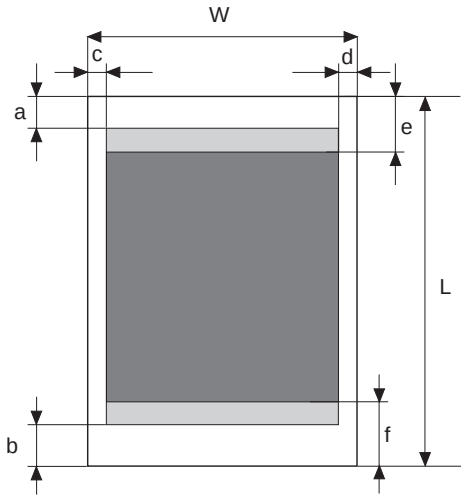
NOTE

- The header and footer are printed in the printing range.
- The shaded area is included in the left and right margin errors of the paper trailing edge.
- The printing range is set in user data **"PRINTER SETTINGS", "PAPER SIZE"**.

Printing range (Color FAX & Printer mode)

Plain paper and Special media (Color FAX & Printer mode)

W × L = Min. 7.17 × 1012 inch(182 × 257 mm)
Max. 8.5 × 14.0 inch(216 × 356 mm)



Feed direction

a = (Plain paper , etc.) 0.12 inch/3.0 mm
(Fabric sheet only) 1.5 inch/38.1 mm

e = 0.63 inch/16.0 mm (BC-20)
0.81 inch/20.5 mm (BC-21e)
1.00 inch/25.4 mm (BC-22e)

b = 0.27 inch
7 mm

f = 0.93 inch/23.5 mm

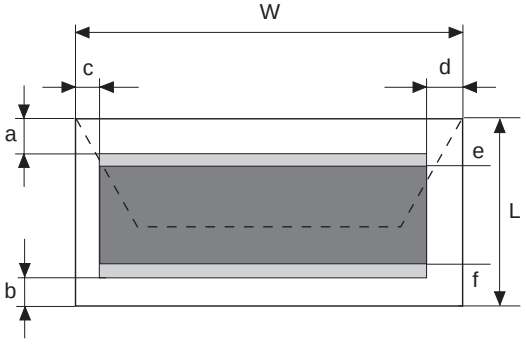
c = (A4) 0.13 inch/3.4 mm
(LTR, LGL) 0.25 inch/6.4 mm

: Recommended printing area

: Printable area
(contains recomended printing area)

Envelopes

W × L = (COM #10)
9.48 × 4.17 inch(241 × 106 mm)
(DL)
8.66 × 4.33 inch(220 × 110 mm)



a = 0.12 inch/3.0 mm

b = 0.28 inch/7 mm

c = 0.27 inch/6.4 mm

d = (COM #10) 1.24 inch/31.4 mm
(DL) 0.41 inch/10.4 mm

e = 0.81 inch/20.5 mm

f = 0.93 inch/23.5 mm

Feed direction

Figure 1-3 Printing Range

2.6 Copy Specification

Color copy	Yes		
Multiple copy	99 copies (Black & white mode only)		
Copy mode			
	Black & white	B&W TEXT, B&W PHOTO	
	Color	COLOR FINE, COLOR DRAFT, COLOR SNAPSHOT	
Copy resolution			
	Scanning	Black & white	360 dpi × 360 dpi (direct copy)
			8 dot/mm × 7.7 line/mm (memory copy)
		Color	360 dpi × 360 dpi (FINE or SNAPSHOT)
			180 dpi × 360 dpi (DRAFT)
	Printing	360 dpi × 360 dpi	
Copy magnification ratio	100%, 90%, 80%, 70%		

2.7 Function

Dialling	
Manual dialling	Numeric button
Auto dialing	Max. 120 digits One-touch:12, Coded speed:100, Numeric button:1
Group dial	Max.111 locations
Redial	Numeric button redial function (Max. 120 digits)
Transmission	
Broadcast transmission	Max. 113 locations (One-touch:12, Coded speed:100, Numeric button:1)
Delayed transmission	Yes (PC Assisted) Max. 30 reservation
Confidential Tx/Rx	None
Relay broadcasting originating	None
Relay broadcasting	None
Reception	
Dual Access	Yes
FAX/TEL switching	Yes
Method	CNG, ROT(Re-Order Tone) detection
Message	None
Pseudo CI	None
Pseudo ring	Yes
Pseudo ringback tone	Yes
Reduction settings for reception	Yes
Automatic reduction of reception images	Yes (100% ~ 70%)
Built-in Answering machine	None
Answering machine connection	Yes (Telephone answering priority type)
Remote reception	Yes (Remote ID method)
Memory lock reception	None
Reception printing in reverse order	None
Polling	
Polling transmission	None
Polling reception	None

Others	
Closed network	None
Direct mail prevention	None
Reception printing in reverse order	None
Memory box	None
Memory backup	
Backup contents	Dial registration data, User data, Service data, Time
Backup IC	256 kbit SRAM for control
Backup device	Lithium battery 3.0V DC/220 mAh
Battery life	Approx. 5 years
Image data backup	None
Image Memory	Approx. 6.6 MB (MultiPASS C560) Approx. 672 KB (MultiPASS C530)
Activity management	Yes
a) User report	
Activity management report (Every 20 transactions : always transmission and reception together)	
Activity report (sending/receiving)	
One-touch speed dialling list	
Coded speed dialling list	
Group dialling list	
Memory clear list	
User's data list	
Document memory list	
Multi activity report	
b) Service report	
System data list	
System dump list	
Error list	
Transmitting terminal identification	Yes
Time	
Management data	Year/month/date/day/hour/minute (24 hour display)
Precision	±90 sec per month
Display	1 row × 16 digits
Completion stamp	None
Program button	None
Hook button	Yes
Telephone exchange function	None
Speaker phone	None
Demo print function	None
HELP function	None

3. OVERVIEW

3.1 External View

Front View

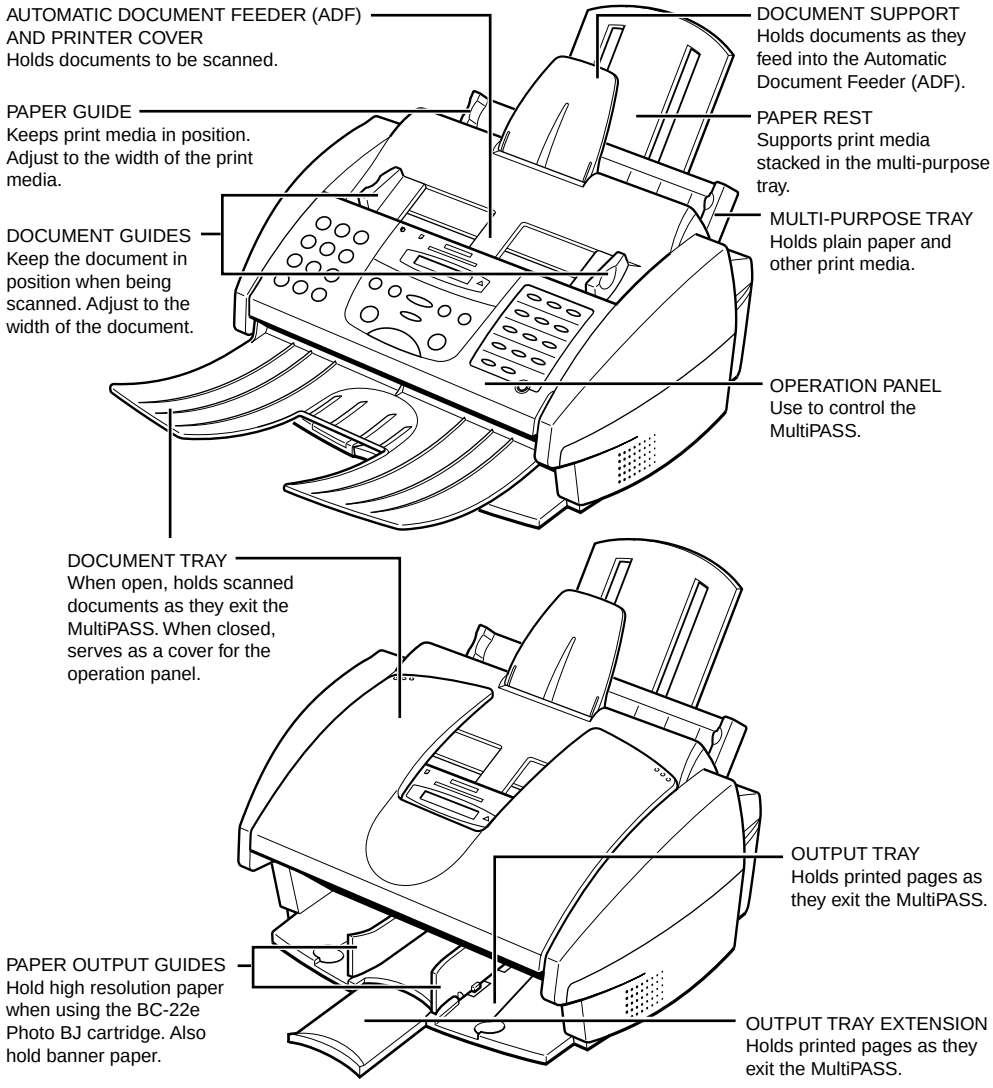
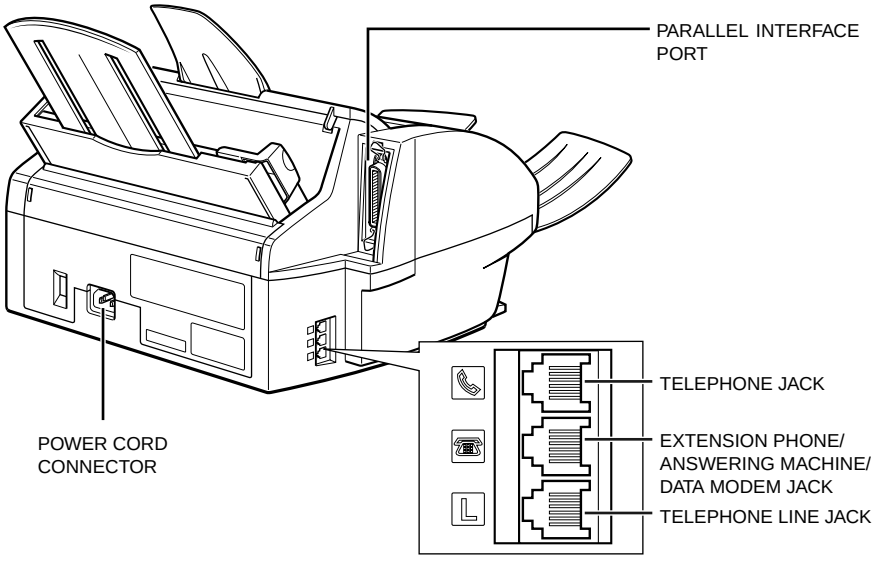

AUTOMATIC DOCUMENT FEEDER (ADF) AND PRINTER COVER
Holds documents to be scanned.
PAPER GUIDE
Keeps print media in position. Adjust to the width of the print media.
DOCUMENT GUIDES
Keep the document in position when being scanned. Adjust to the width of the document.
DOCUMENT TRAY
When open, holds scanned documents as they exit the MultiPASS. When closed, serves as a cover for the operation panel.
PAPER OUTPUT GUIDES
Hold high resolution paper when using the BC-22e Photo BJ cartridge. Also hold banner paper.
DOCUMENT SUPPORT
Holds documents as they feed into the Automatic Document Feeder (ADF).
PAPER REST
Supports print media stacked in the multi-purpose tray.
MULTI-PURPOSE TRAY
Holds plain paper and other print media.
OPERATION PANEL
Use to control the MultiPASS.
OUTPUT TRAY
Holds printed pages as they exit the MultiPASS.
OUTPUT TRAY EXTENSION
Holds printed pages as they exit the MultiPASS.

Figure 1-4 External View (1)

Back View



Inside View

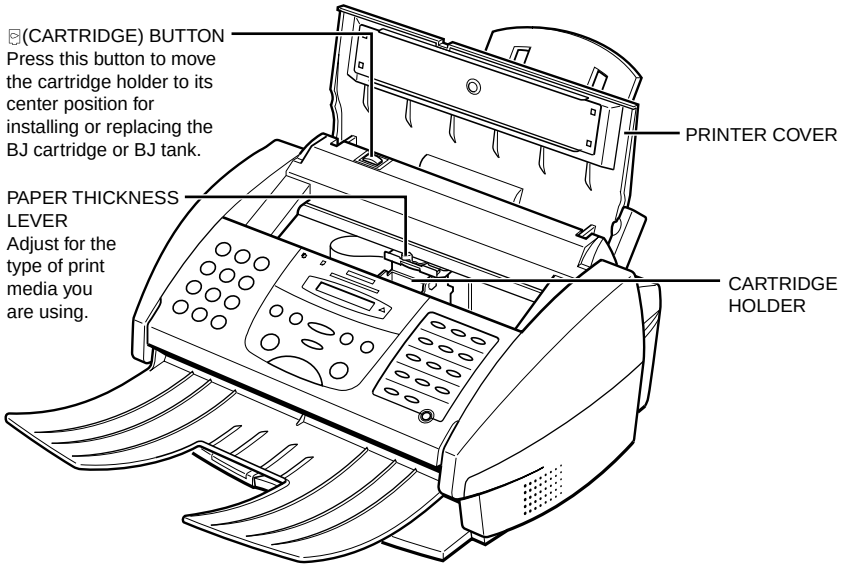
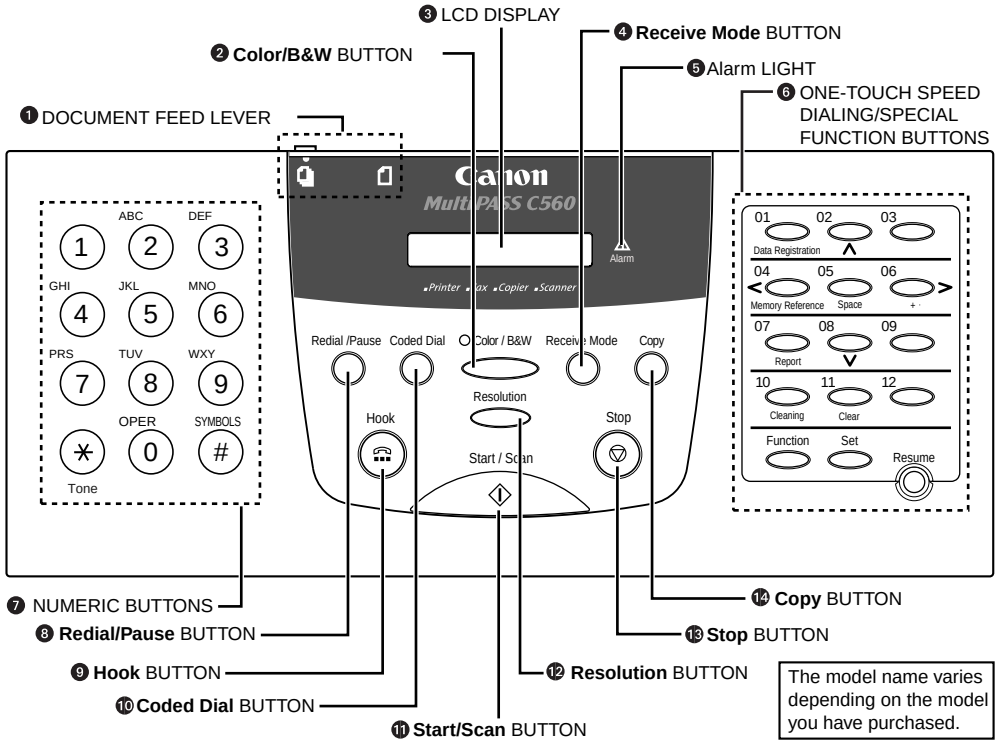

(CARTRIDGE) BUTTON
Press this button to move the cartridge holder to its center position for installing or replacing the BJ cartridge or BJ tank.
PRINTER COVER
PAPER THICKNESS LEVER
Adjust for the type of print media you are using.
CARTRIDGE HOLDER

Figure 1-5 External View (2)

3.2 Operation Panel

Operation Panel



❶ **Document Feed Lever**

Sets the Automatic Document Feeder (ADF) to (automatic document feed) for feeding multipage documents, or to (manual document feed) for feeding single sheets.

❷ **Color/B&W Button**

Sets the unit for color or black & white transmission or copying. For color transmission or color copying, press this button to turn on its light.

❸ **LCD Display**

Displays messages and prompts during operation, and displays selections, text, numbers, and names when registering information.

❹ **Receive Mode Button**

Selects the receive mode.

Figure 1-6 Operation Panel (1)

❺ **Alarm Light**

Flashes when an error occurs, or when the MultiPASS is out of paper or ink.

❻ **One-Touch Speed Dial/Special Function Buttons**

Dial fax/telephone numbers registered for one-touch speed dialing. Also used to perform special functions.

❼ **Numeric Buttons**

Enter numbers when dialing or registering numbers. Also enter letters when registering names.

❽ **Redial/Pause Button**

Redials the last number that was dialed using the numeric buttons (regular dialing). Also enters pauses between or after the telephone/fax number when dialing or registering numbers.

❾ **Hook Button**

Engages or disengages the telephone line.

❿ **Coded Dial Button**

Press this button and a two-digit code to dial a fax/telephone number that you have registered for coded speed dialing.

⓫ **Start/Scan Button**

Starts sending, receiving, scanning, and copying.

⓬ **Resolution Button**

Selects the resolution the MultiPASS uses for the document you are sending or copying.

⓭ **Stop Button**

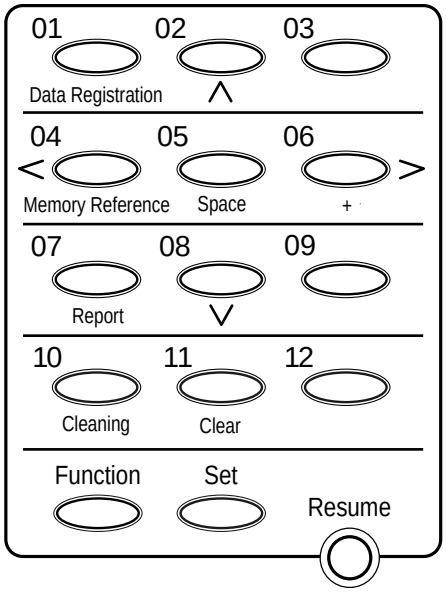
Cancels sending, receiving, registering data, copying and other operations, and returns the MultiPASS to standby mode.

⓮ **Copy Button**

Sets the MultiPASS to make copies.

Figure 1-7 Operation Panel (2)

Special Function Buttons



❑ **Data Registration Button**

Accesses the different menus for setting speed dialing, user preferences, sending and receiving options, and many other important settings.

❑ **∧, ∨ Buttons**

Scroll through the settings so you can see other selections in the menus during data registration.

❑ **Memory Reference Button**

Performs operations with documents currently stored in memory, including printing a list of documents, printing a document, and deleting a document.

❑ **Space Button**

Enters a space between letters and numbers when registering information.

Figure 1-8 Operation Panel (3)

- **+ Button**

  Enters a plus sign (+) when registering your unit telephone/fax number.

- **<, > Buttons**

  Move the cursor left or right when registering data.

- **Report Button**

  Prints reports containing information registered in the unit and information on transactions.

- **Cleaning Button**

  Prints the nozzle check and performs cleaning operations for the BJ cartridge print head and unit rollers.

- **Clear Button**

  Clears an entire entry when registering information.

- **Function Button/Light**

  Accesses the special function buttons. To use the special function buttons, press this button to turn on its light. To use the one-touch speed dialing buttons, press to turn off its light.

- **Set Button**

  Selects a menu setting and registers information during data registration.

- **Resume Button**

  Form-feeds paper when printing, and resumes printing after an error is corrected.

Figure 1-9 Operation Panel (4)

Entering Numbers, Letters, and Symbols

Each numeric button has a number and a group of uppercase and lowercase letters assigned to it. Use the chart below to determine which numeric button to press for each character.

Button	Letters (:A)	Numbers (:1)
1		1
ABC 2	A B C a b c	2
DEF 3	D E F d e f	3
GHI 4	G H I g h i	4
JKL 5	J K L j k l	5
MNO 6	M N O m n o	6
PRS 7	P Q R S p q r s	7
TUV 8	T U V t u v	8
WXY 9	W X Y Z w x y z	9
OPER 0		0
SYMBOLS #	– . ✳ # ! " , ; : ^ ` _ = / | ' ? $ @ % & + ( ) [ ] { } < >	
✳ Tone	Letter input (:A) ⟷ Number input (:1)	

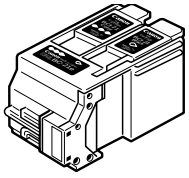
Figure 1-10 Operation Panel (5)

3.3 Consumables

3.3.1 BJ cartridge and ink cartridge and BJ cartridge container

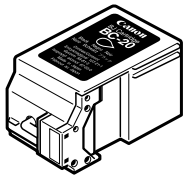
BJ Cartridges and BJ Tanks

Canon offers several BJ cartridges and BJ tanks for use in the MultiPASS.



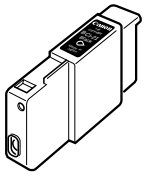
- **BC-21e Color BJ Cartridge (included with the MultiPASS)**

  Contains the print head unit and two replaceable BJ tanks, one color (cyan, magenta, yellow) and one black. You can replace the BJ tanks without replacing the print head unit when you run out of ink.



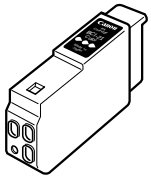
- **BC-20 Black BJ Cartridge (sold separately)**

  Contains the print head unit and black ink only. Use this optional cartridge when you will be printing with black ink only and for fast, five pages per minute printing. When you run out of ink, you replace the complete cartridge.



- **BCI-21 Black BJ Tank (included with the MultiPASS)**

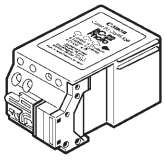
  Replace the black BJ tank in the BC-21e Color BJ cartridge when the black ink runs out.



- **BCI-21 Color BJ Tank (sold separately)**

  Replace the color BJ tank in the BC-21e Color BJ cartridge when the color ink runs out.

Figure 1-11 Consumables (1)



❑ **BC-22e Photo BJ Cartridge (sold separately)**

Contains the print head unit and color and black inks. Use this optional BJ cartridge when you want to produce photo-realistic color printing. When used with Canon's High Resolution Paper HR-101, this BJ cartridge produces images comparable to photographs. When you run out of ink, you replace the complete cartridge.

Note

Since the BC-22e Photo BJ cartridge is designed to produce special printing effects, we do not recommend using it for tasks other than printing from your PC. This cartridge is a single unit, and using it for other tasks may use up the black ink faster, wasting its color ink. In addition, correct color output cannot be guaranteed for the BC-22e Photo BJ cartridge, for tasks such as copying or printing of received faxes.

We recommend using the BC-21e Color BJ cartridge or the optional BC-20 Black BJ cartridge for tasks such as printing received faxes, copying, and printing reports.

Figure 1-12 Consumables (2)

3.3.2 Print media

Plain Paper

The MultiPASS supports paper sizes of letter, legal, and A4 in portrait orientation. You can use regular copier paper, cotton bond paper, and typical letterhead. Your unit does not require special ink jet paper, and produces letter quality print on most plain bond paper, including cotton bond and photocopy paper. Always use paper without curls, folds, staples, or damaged edges. Copier paper has a preferred side for printing. Look at the label on the package to see which side to print on.

Envelopes

The MultiPASS can print on U.S. Commercial No. 10 envelopes and European DL envelopes.

The following envelopes are not recommended because they may cause jams or smears, or may damage your unit:

- ❑ Envelopes with windows, holes, perforations, cutouts, and double flaps.
- ❑ Envelopes made with special coated paper or deeply embossed paper.
- ❑ Envelopes using peel-off sealing strips.
- ❑ Envelopes in which letters have been enclosed.

You may be able to stack envelopes of other sizes in the multi-purpose tray. However, Canon cannot guarantee consistent performance on envelope sizes other than U.S. Commercial No. 10 or European DL.

Glossy Photo Paper

Canon Glossy Photo Paper GP-201 is a high gloss, thick paper that produces the look and feel of a photograph. Use this paper with the BC-22e Photo BJ cartridge to produce photo-realistic prints from your MultiPASS.

Banner Paper

This paper is specifically designed for printing one continuous sheet in a banner format. The connected sheets are divided by a perforation. You can print from two to six sheets at one time. Canon's Banner Paper is specially designed for use with Bubble Jet printers and to produce bright and vivid color images.

High Resolution Paper

Canon High Resolution Paper HR-101 is designed to produce near-photographic quality print output with sharp and vivid graphics. For best results, use Canon High Resolution Paper HR-101 with the optional BC-22e Photo BJ cartridge to produce images comparable to your favorite photographs. When using this paper, be sure to print on the whiter side of the sheets, and after printing a pack of this paper, use the cleaning sheet provided with it to clean the unit's rollers.

Figure 1-13 Print Media (1)

Bubble Jet Paper (water resistant)

Canon Bubble Jet Paper LC-301 has been developed for high quality printing with minimal or no smearing or running when in contact with water or damp surfaces, making it a good choice for damp environments. Images printed on this paper are bright and vivid and will not run if liquid is spilled on them. This paper also stands up to normal office highlighters, unlike images printed on other paper. The paper is specially coated and printable on both sides.

Fabric Sheets

Use the white cotton Fabric Sheet FS-101 for Canon BJ color printers to print pillow covers, scarves, flags, and other textile items. Use these sheets for appliqués, cross stitch, and other craft and sewing projects.

Back Print Film

Canon Back Print Film BF-102 has been specially developed for Canon Color Bubble Jet printers and MultiPASS products. The unique mylar-based translucent sheet is designed to deliver sharp, brilliant, high-intensity color images suitable for business presentations, design work, or professional reports. Back print film is printed on the back (non-glossy) side of the film in mirror image and then viewed from the front (glossy) side using a backlit device, such as a light box. For more details, ask your local authorized Canon dealer sales or service representative, or refer to the manual supplied with the film.

High Gloss Film

The Canon High Gloss Film HG-101 features a bright white finish that lends striking visual power to charts, graphs, and photographic images. It creates a sharper and more vivid color output than is possible with coated paper. Use of this film gives your presentation materials and graphics a professional look. This film provides the best color print quality for the BC-21e Color BJ cartridge and is recommended when printing at 720 × 360 dpi.

Transparencies

CF-102 Transparencies from Canon are recommended. These transparencies produce excellent contrast, sharpness, and color to produce crisp and professional overhead presentations. Do not use normal transparencies in the MultiPASS, as they do not absorb ink and may cause ink to run.

Assorted Paper Starter Kit

If you would like to try some of the papers described above, look for Canon's Starter Kit (SK-102). It contains an assortment of five paper types.

Canon Photo Kit

Canon's Photo Kit includes the BC-22e Photo BJ cartridge, the SB-21 BJ cartridge container, and 60 sheets of Canon High Resolution Paper HR-101.

Figure 1-14 Print Media (2)

4. DIMENSION

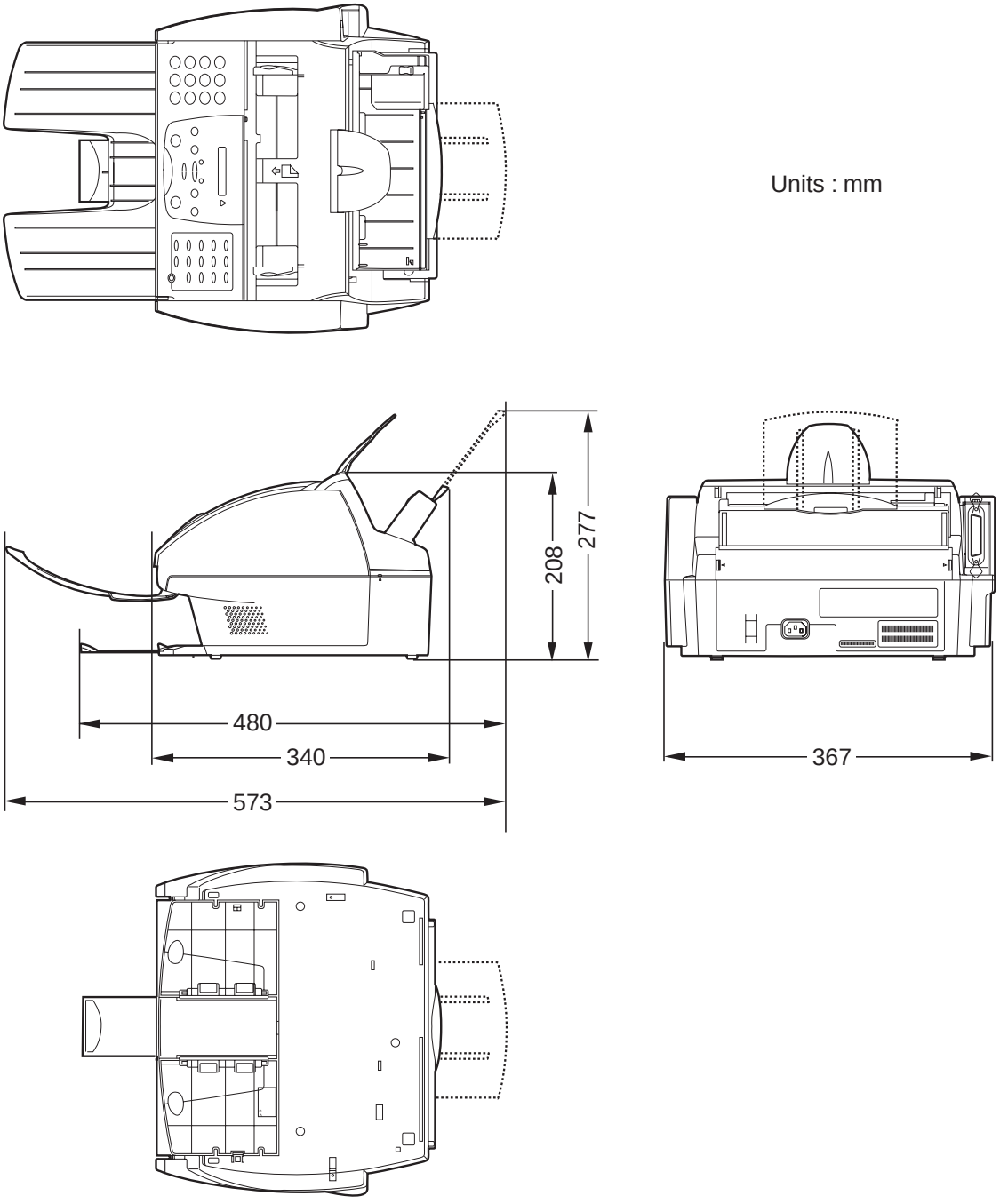


Figure 1-15 Dimensions

5. SAFETY & PRECAUTIONS

5.1 Personnel Hazards
Electrical Shock and High-Temperature Parts

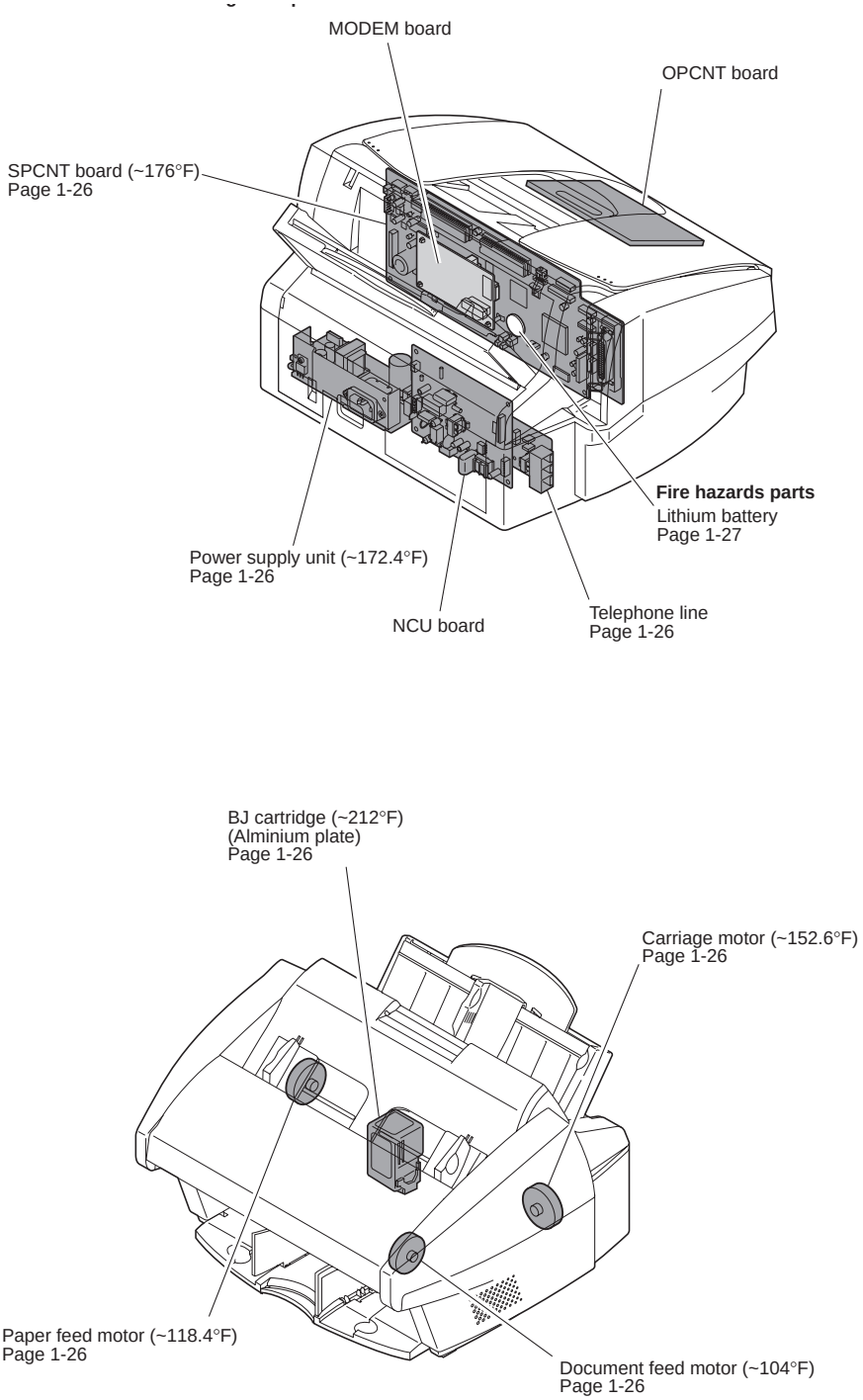
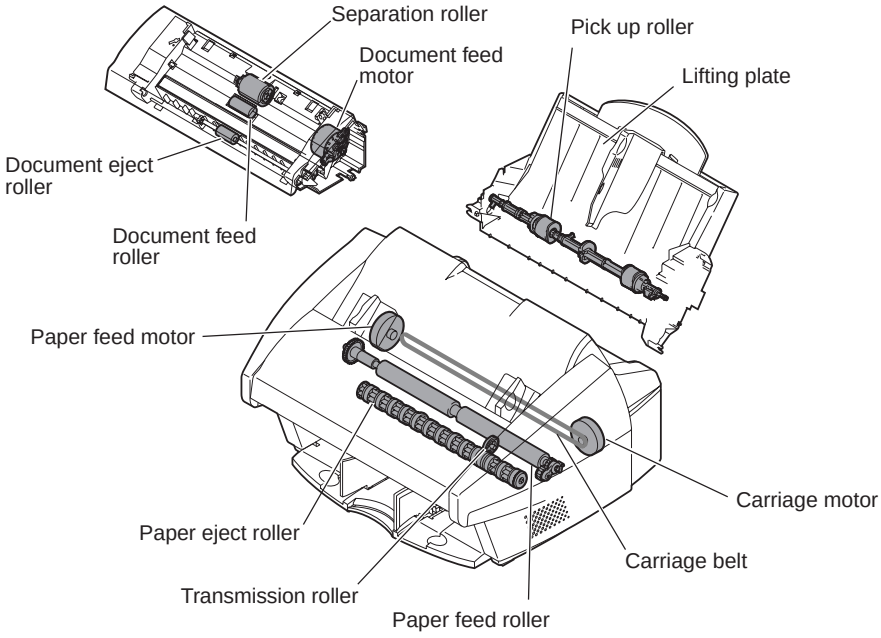


Figure 1-16 Personal Hazards (1)

Moving parts > Page 1-27



Preventing ink stains > Page 1-27

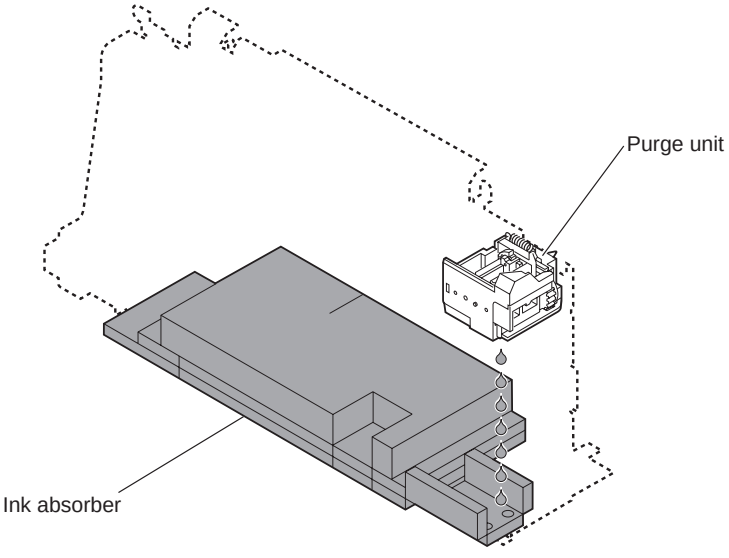


Figure 1-17 Personal Hazards (2)

5.1.1 Electrical shock

Electrical shock hazard

- To prevent electrical shock, be sure to disconnect the power cord and modular jack before disassembly.
- Remove grounding wrist straps before servicing this unit while the FAX's power is on. Otherwise, electrical shock may occur.

NOTE

Power supply unit

When power is supplied to this unit, 120 VAC will be supplied to the primary side.

Telephone line

If a telephone line is connected to this unit, 48 VDC will be supplied by this line. When a call signal is received, a voltage of 90 VAC Vrms will be supplied.

5.1.2 High-temperature parts

High-temperature warning

To prevent skin burns, disconnect the power cord and let this unit stand for at least 10 minutes to allow hot parts to cool.

NOTE

How to treat burns

Heat of about 122°F or more causes burns. Also, the longer the contact, the more severe the burn.

When treating a burn, the first minute after receiving the burn is the most important. Cool the burn immediately with cold running water. In case of a serious burn, seek medical attention immediately.

NOTE

The parts which get hot during operation are indicated. For the location of these parts, refer to the figures.

(Ambient temperature 80°F (27°C) continuous copy operation)

Document feed motor (approx. ~ 104°F (40°C))
Paper feed motor (approx. ~ 118.4°F (48°C))
Carriage motor (approx. ~ 152.6°F (67°C))
Power supply unit (Max. ~ 172.4°F (78°C))
SPCNT board assembly (approx. ~ 176°F (80°C))
BJ cartridge (max. ~ 212°F (100°C))

5.1.3 Fire hazards

Do not dispose in fire.

Do not dispose of lithium batteries in fire. Doing so may rupture the battery and expose flammable materials.

Follow applicable local regulations when disposing of the SPCNT board assembly's lithium battery.

Fire hazard

When using IPA or other solvents during servicing, heat or sparks from internal electronic circuits can ignite the solvent. Before using such solvents, be sure to turn off the power source and wait until the high-temperature parts cool. Use the solvent in a well-ventilated area.

5.1.4 Moving parts

Moving parts

To prevent mishaps due to moving or rotating parts during servicing, be sure to disconnect the power cord before disassembly.

Since the this unit does not have a sensor on the printer cover, the carriage and rollers will not stop even if the printer cover is opened during a printing operation. If the printer cover must be opened during printing, beware of the moving parts.

Figure 1-16 shows the driving section's location.

5.1.5 Preventing ink stains

Avoid touching the BJ cartridge ink nozzles, ink pad, head cap, head wiper, and ink absorbers. The ink can stain your hands, clothes, etc. Although the ink is water soluble, it is permanent and will permanently stain clothing, etc.

NOTE

Although the ink is not toxic, it contains an organic solvent (isopropyl alcohol 67-63-0). If the ink enters the eyes accidentally, flush the eyes with running water and see a doctor. If the ink is swallowed accidentally, see a doctor immediately and give the information printed on the BJ cartridge label.

5.2 General Cautions
5.2.1 Unit cautions

Important Safety Instructions

Read these safety instructions thoroughly before using your MultiPASS, and keep them handy in case you need to refer to them later.

Except as specifically described in this guide, do not attempt to service the MultiPASS yourself. Never attempt to disassemble the unit: opening and removing its interior covers will expose you to dangerous voltages and other risks. For all service, contact your local authorized Canon dealer sales or service representative.

- ❑ Follow all warnings and instructions marked on the MultiPASS.
- ❑ Place the MultiPASS on a level surface. To avoid serious damage from falling, never place the unit on an unstable cart, stand, or table.
- ❑ Do not use the MultiPASS near water. Make sure that no wet or humid objects come into contact with the unit.
- ❑ To ensure reliable operation of the MultiPASS and to protect it from overheating (which can cause it to operate abnormally and create a fire risk), never block or cover any openings on the unit by placing it on a bed, sofa, rug, or other similar surface. Do not place the unit in a closet or built-in installation, or near a radiator or other heat register unless proper ventilation is provided. See *Choosing a Location for Your MultiPASS* for guidelines on how much space the unit needs for ventilation.
- ❑ Only operate the MultiPASS from the type of power source indicated on the unit's label. If you are not sure of the type of power available, consult your dealer or local power company.
- ❑ The MultiPASS is equipped with a three-prong, grounding-type plug provided with a third (grounding) pin. This plug will only fit into a grounding-type outlet. This is a safety feature. If you are unable to insert the plug into your outlet, contact an electrician to replace your outlet. Do not defeat the safety purpose of the grounding-type plug by breaking off the third prong or using a 3-to-2 adapter.

- ❑ Make sure the total amperage used by all devices plugged into the wall outlet does not exceed the ampere rating of the outlet's circuit breaker.

- ❑ Do not allow anything to rest on the power cord, and do not locate the unit where the cord will be walked on. Make sure the cord is not knotted or kinked.

- ❑ If you use an extension cord with the MultiPASS, make sure that the total of the ampere ratings on the products plugged into the extension cord does not exceed the extension cord ampere rating. Also make sure that the total ampere rating of all products plugged into the wall outlet does not exceed the current amperage of the circuit breaker.

- ❑ Do not push objects of any kind into the slots or openings on the cabinet as they may touch dangerous voltage points or short out parts. This could result in fire or electric shock.

- ❑ Do not allow small objects (such as pins, paper clips, or staples) to fall into the MultiPASS. If something does fall into it, unplug the unit immediately and call your local authorized Canon dealer sales or service representative.

- ❑ To avoid spillage in or around the unit, do not eat or drink near the unit. If you spill liquid or if any substance falls into the unit, immediately unplug the unit and call your local authorized Canon dealer sales or service representative.

- ❑ Always unplug the MultiPASS before moving or cleaning it.

- ❑ Whenever you unplug the MultiPASS, wait at least five seconds before you plug it in again.

- ❑ During electrical storms, disconnect the power cord from the power outlet. (Please note that any documents stored in the unit's memory will be deleted when you unplug the unit.)

- ❏ Do not stack boxes or furniture around the power outlet. Keep the area open so you can reach the outlet quickly. If you notice anything unusual (smoke, strange odors, noises) around the MultiPASS, unplug the unit immediately. Contact your local authorized Canon dealer sales or service representative.

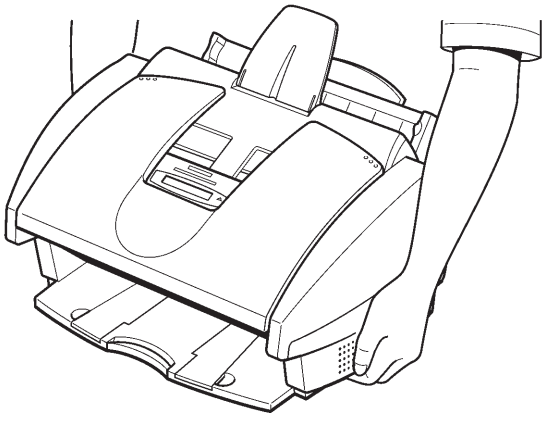
- ❏ To avoid paper jams, never unplug the power cord, open the printer cover, or remove paper from the multi-purpose tray while printing.

- ❏ Keep the MultiPASS away from direct sunlight, as this can damage it. If you have to place it near a window, install heavy curtains or blinds.

- ❏ Do not expose the MultiPASS to extreme temperature fluctuations. Install the unit in a place with temperatures in the 50°–90.5°F (10°–32.5°C) range.

- ❏ Before you transport the MultiPASS, remove its BJ cartridge.

- ❏ Always lift the MultiPASS as shown below. Never lift it by its multi-purpose tray, document support, or document tray.



- ❑ Unplug the MultiPASS from the wall outlet and refer service to qualified personnel under the following conditions:
  - When the power cord or plug is damaged or frayed.
  - If liquid has spilled into the unit.
  - If the unit has been exposed to rain or water.
  - If the unit does not operate normally when you have followed the instructions in this guide. Adjust only those controls that are covered by the operating instruction in this guide. Improper adjustment of other controls may result in damage and may require extensive work by a qualified technician to restore the product to normal operation.
  - If the unit has been dropped or the cabinet has been damaged.
  - If the unit exhibits a distinct change in performance, indicating a need for service.
- ❑ Plug the MultiPASS into a standard 120 V AC power outlet. Do not attempt to use it outside of the country where you purchased it.
- ❑ Do not plug the MultiPASS into the same circuit as an appliance such as an air conditioner, electric typewriter, television, or copier. Such devices generate electrical noise that can interfere with your MultiPASS' ability to send and receive faxes.
- ❑ Check the plug frequently and make sure that it is firmly plugged into the socket.

This product emits low level magnetic flux.
If you use a cardiac pacemaker and feel abnormalities, please move away from this product and consult your doctor.

Choosing a Location for Your MultiPASS

Before unpacking your MultiPASS, follow these guidelines to choose the best location for it:

Please review the information provided in *Important Safety Instructions*, to make sure you are installing your MultiPASS for safe use.

- ❏ Put the MultiPASS in a cool, dry, clean, well ventilated place:
  - Make sure the area is free from dust.
  - Make sure the location is not affected by extreme temperature changes, and always stays between 50° and 90.5°F (10° and 32.5°C).
  - Make sure the area's relative humidity is always between 20% and 85%.
- ❏ Keep the MultiPASS away from direct sunlight. If you have to place the unit near a window, install heavy curtains or blinds to protect the unit from sunlight.
- ❏ If possible, put the MultiPASS near an existing telephone outlet, to avoid the expense of installing a new one. You must have an RJ11-C wall jack installed. If you need assistance, contact your local authorized Canon dealer sales or service representative.
- ❏ Place the unit near a standard 120 V AC power outlet.
- ❏ Place the MultiPASS near the PC you will be connecting it to. Make sure you can reach it easily, as you will be using it as a printer, fax machine, copier, scanner, and telephone.
- ❏ Do not use or store the unit outdoors.
- ❏ To avoid damage to the unit from overheating, do not block the exhaust vent. Install the unit approximately 4 inches (10 cm) away from walls or other equipment.
- ❏ Do not plug the MultiPASS into the same circuit as an appliance such as an air conditioner, electric typewriter, television, or copier. Such devices generate electrical noise that can interfere with your MultiPASS' ability to send and receive faxes.
- ❏ Set the MultiPASS on a flat, stable, vibration-free surface that is strong enough to support its weight (approx. 11.2 lb./5.1 kg).
- ❏ Do not install the MultiPASS near devices that contain magnets or generate magnetic fields, such as speakers.

Connecting the Power Cord

Follow these guidelines when connecting your MultiPASS to a power source:

- ❑ **The MultiPASS is intended for use in the U.S. and Canada only and requires 120 V AC. Do not use it outside the U.S. or Canada.**
- ❑ **Only plug the unit into a 120-volt AC 60 Hz, three-prong grounded outlet.**
- ❑ **Use only the power cord that came with the unit. Using a longer cord or extension cord can cause the unit to malfunction.**
- ❑ **Unplug the unit only by pulling on the plug itself. Never pull on the cord.**
- ❑ **The MultiPASS is equipped with a three-prong, grounding-type plug provided with a third (grounding) pin. This plug will only fit into a grounding-type outlet. This is a safety feature. If you are unable to insert the plug into your outlet, contact an electrician to replace your outlet. Do not defeat the safety purpose of the grounding-type plug by breaking off the third prong or using a 3-to-2 adapter.**
- ❑ **Do not plug the MultiPASS into the same circuit as an appliance such as an air conditioner, electric typewriter, television, or copier. Such devices generate electrical noise that can interfere with your MultiPASS' ability to send and receive faxes.**
- ❑ **Do not allow anything to rest on the power cord, and do not locate the unit where the cord will be walked on. Make sure the cord is not knotted or kinked.**
- ❑ **Make sure that the total ampere rating of all products plugged into the wall outlet does not exceed the current amperage of the circuit breaker.**
- ❑ **Make sure the operation panel of the MultiPASS is properly closed, and that there are no documents in this area.**

5.2.2 BJ cartridge cautions

a) General cautions

Installing the BJ Cartridge

This section explains how to install the BJ cartridge in the MultiPASS so that you can begin using your unit.

The MultiPASS comes with one BC-21e Color BJ cartridge and one BCI-21e Black BJ tank.

BJ Cartridge Guidelines

The most important thing you can do to ensure the best possible print quality, as well as extend the life of your MultiPASS, is to take care of the MultiPASS' BJ cartridges following these guidelines:

- ❏ Store BJ cartridges at room temperature.
- ❏ Keep BJ cartridges in their sealed containers until you are ready to use them.
- ❏ Do not shake BJ cartridges vigorously while handling.
- ❏ To change a BJ cartridge, be sure to press the button (inside the unit) to move the cartridge holder to the center.
- ❏ Install the BJ cartridge immediately after removing its print head cap and protective tape.
- ❏ Always use the BJ cartridge within one year of unpacking it.
- ❏ When changing BJ cartridges, always store the unused BJ cartridge in the SB-21 BJ cartridge container provided with the MultiPASS.
- ❏ Do not remove the BJ cartridge from the MultiPASS unless necessary.

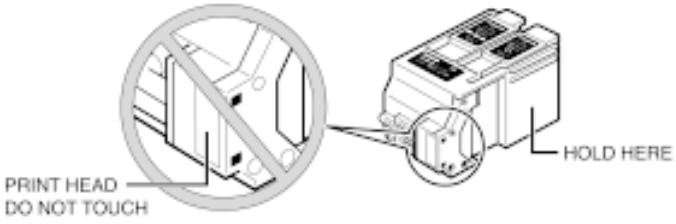
Note

The ink in the BJ cartridges is difficult to clean up if spilled. To avoid spilling ink, always be sure to follow these precautions when handling the BJ cartridges:

- ❏ Do not attempt to disassemble or refill the BJ cartridge or BJ tank.
- ❏ Do not shake or drop the BJ cartridge, or tip the print head downward.
- ❏ Keep BJ cartridges out of children's reach.

CAUTION

Hold the BJ cartridge by its sides only. Do not touch the print head, the sharp edges around the print head, the silver plate on the bottom of the BJ cartridge, or the silver metal or circuit area on its side.



- ❏ Make sure the cartridge holder is in its home position (on the right side of the unit) when you are not using the MultiPASS. If it is not in its home position, press the button (inside the unit). Leaving it out of its home position will dry out the print head on the BJ cartridge.
- ❏ Clean the print head when print quality is no longer satisfactory. Refer to *Testing and Cleaning the BJ Cartridge Print Head*. If the print quality does not improve after five consecutive cleanings, replace the BJ tank or BJ cartridge.
- ❏ Do not use a BC-21e Color BJ cartridge with either of its BJ tanks missing. Doing so can cause the ink to clog.
- ❏ Do not remove the BJ tanks from the BC-21e Color BJ cartridge unnecessarily, or the ink in them may clog.

Using Ink

Canon has more engineers dedicated to creating quality ink for providing the best results for output on Bubble Jet printers than any other organization. Canon does not prohibit the use of third-party inks and the use of third-party inks does not invalidate the product's limited warranty. However, Canon cannot guarantee the quality or performance of your unit when you are using inks from other suppliers.

Canon's limited warranty does not cover damage caused to Canon's Bubble Jet products that is attributable to the use of third party parts or supplies, including inks. The limited warranty remains in effect for its life once that particular damage has been properly repaired.

- For optimum printing results, Canon recommends that you use the Canon BC-21e Color BJ cartridge or the optional Canon BC-20 Black or BC-22e Photo BJ cartridge with your MultiPASS.
- When replacing BJ tanks in the BC-21e Color BJ cartridge, Canon recommends that you use the Canon BCI-21 Color and BCI-21 Black BJ tanks.

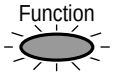
Testing and Cleaning the BJ Cartridge Print Head

The print head in the BJ cartridge contains nozzles through which ink is propelled onto the paper. To maintain the best possible print quality, these nozzles need to be cleaned from time to time. Your MultiPASS is equipped with a print head cleaning function that does this.

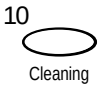
Printing the Nozzle Check

Before cleaning the print head, you may want to print the nozzle check to test the BJ cartridge installed in the MultiPASS. This test shows if each print head nozzle is operating properly.

Follow this procedure to print the nozzle check:



1. Press **Function**.



2. Press **Cleaning**.

```
NOZZLE CHECK
```

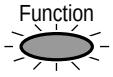
3. Press **Set**.
   - ❏ The MultiPASS prints the nozzle check.

Cleaning the BJ Cartridge Print Head

If your printouts become faint or streaked, or if their quality otherwise decreases, clean the print head. To maintain the best possible print quality, you need to clean the BJ cartridge print head from time to time.

Cleaning the print head consumes a small amount of ink. Cleaning too often reduces the amount of ink in the BJ cartridge.

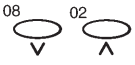
If your printing is faint, you can often correct the problem by adjusting the print contrast and printing speed.



1. Press **Function**.

2. Press **Cleaning**

```
NOZZLE CHECK
```



3. Use V or ∧ to select HEAD CLEANING.

```
HEAD CLEANING
```

4. Press **Set**.
   - ❑ The MultiPASS cleans the print head.

When cleaning ends, the MultiPASS returns to standby mode.

You can perform the cleaning procedure up to five consecutive times if necessary.

If the problem persists, install a new BJ cartridge.

You can print the nozzle check to see if cleaning corrected the problem.

When to Replace the BJ Cartridge

How frequently you need to replace your MultiPASS' BJ cartridge or one of its BJ tanks depends on how you use your MultiPASS. If you print a good deal of graphics, halftones, or grayscales, you will need to replace the BJ cartridge more often than if you print mainly text. (See page A-5 for details on the life expectancy of BJ cartridges.)

To help ensure the maximum life for your cartridges, always follow the guidelines for cartridge maintenance given on page 1-32.

In general, you will need to replace the BJ cartridge in the following situations:

- ❏ If you have been using the BC-21e Color BJ cartridge for over six months, or a BC-20 Black BJ cartridge for over a year.
- ❏ If your printed output is not crisp and clear or has gaps in the characters (missing dots), even after you have cleaned the print head five times.
- ❏ If your color printouts appear to be missing a color, even after you have cleaned the print head five times.
- ❏ If the message CHANGE CARTRIDGE appears in the LCD display.

In general, you will need to replace an ink tank in the BC-21e Color BJ cartridge in the following situations:

- ❏ If your output is blank.
- ❏ If your color printouts appear to be missing a color, even after you have cleaned the print head five times.
- ❏ If the message BLACK INK EMPTY or COLOR INK EMPTY appears in the LCD display.

Use the procedure on the following page to replace an old BJ cartridge or change a BJ cartridge when switching between the BC-21e Color BJ cartridge and any other optional BJ cartridge.

You only need to replace the BC-21e Color BJ cartridge when the print head is damaged (or after printing approximately 2000 pages). If one of the BJ tanks (either color or black) in your BC-21e Color BJ cartridge runs out of ink, refer to the procedure on page 12-26 to replace the BJ tank.

- For optimum printing results, Canon recommends that you use the Canon BC-21e Color BJ cartridge or the optional Canon BC-20 Black or BC-22e Photo BJ cartridge with your MultiPASS.
- When replacing BJ tanks in the BC-21e Color BJ cartridge, Canon recommends that you use the Canon BCI-21 Color and BCI-21 Black BJ tanks.

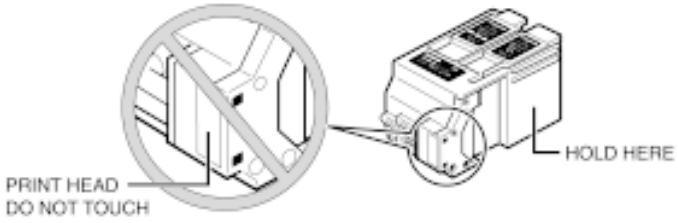
Storing a BJ Cartridge in its Container

Once a BJ cartridge is unwrapped, its print head must be kept from drying out, or it can clog and fail to work properly. A BJ cartridge installed in the MultiPASS is protected from drying out by automatically moving to the home position on the right side of the unit and capping itself.

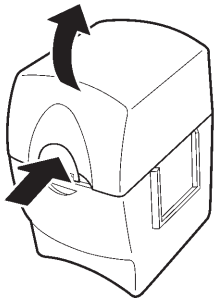
If you remove a partially used BJ cartridge from the MultiPASS, store it in the SB-21 BJ cartridge container provided with your unit.

CAUTION

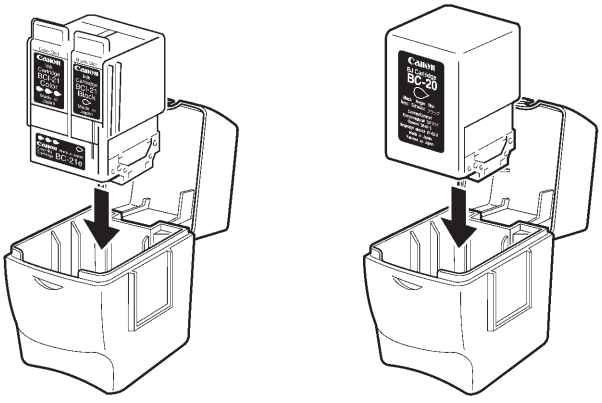
Hold the BJ cartridge by its sides only. Do not touch the print head, the sharp edges around the print head, the silver plate on the bottom of the BJ cartridge, or the silver metal or circuit area on its side.



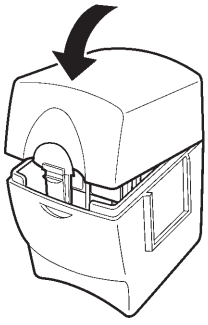
1. Press on the release tab and open the cover.



2. Insert the BJ cartridge in its container with the BJ cartridge's label facing forward, and the print head down.



3. Close the BJ cartridge container lid, and snap it shut.



b) Unpacking the BJ cartridge

Do not open the BJ cartridge packaging unless you are ready to install the new BJ cartridge. Before installing the BJ cartridge, gently remove the orange head cap and the orange protective tape from the nozzles.

NOTE

Storing an opened BJ cartridge

If the BJ cartridge packaging has been opened and the BJ cartridge is not to be installed immediately, store the cartridge in the SB-21 cartridge container, to prevent the printing head from drying out and clogging.

As much as possible, do not open the packaging until the BJ cartridge is to be installed immediately.

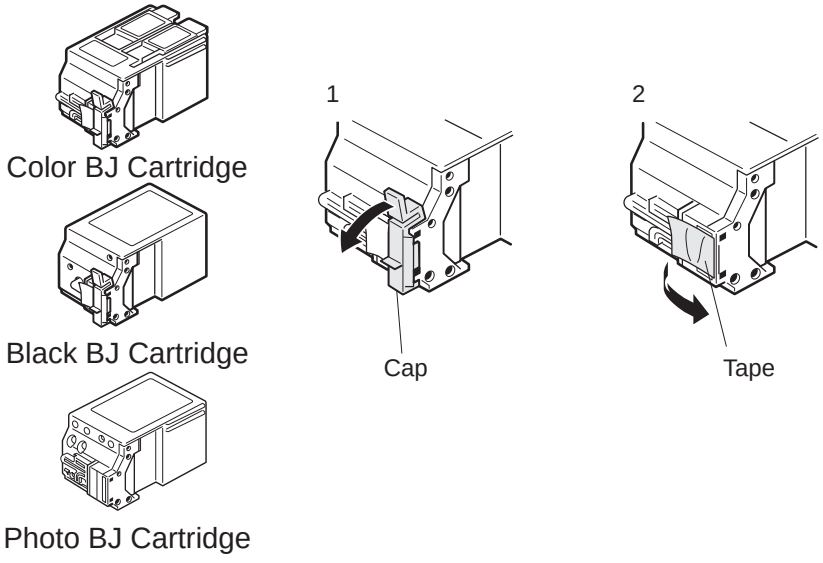


Figure 1-18 Unpacking the BJ Cartridge

c) Protecting the ink nozzles

Do not touch or wipe the ink nozzles with tissue paper, etc. Doing so can clog the nozzles. If the head cap and protective tape have been removed and the BJ cartridge is not to be installed immediately, store the cartridge properly to prevent the nozzles from drying out and clogging.

Do not disassemble the BJ cartridge. Also, the BJ cartridge contains electronic circuitry. Do not wash it with water.

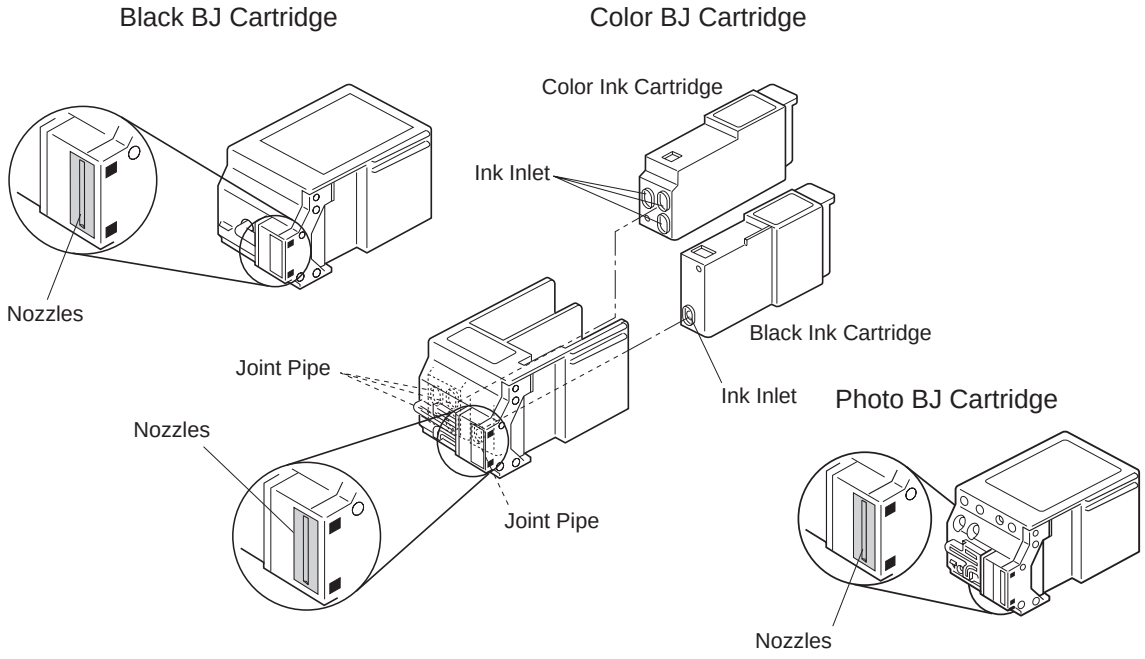


Figure 1-19 Ink Path Cartridge

d) Ink conductivity

The BJ cartridge ink can conduct electricity. If ink has leaked onto any mechanical parts, wipe off with a damp paper towel. If ink has leaked onto the circuit board, use tissue paper and carefully wipe off the ink completely even at the base of the IC chips.

Never turn on the power while ink still remains on the circuit board. Doing so may damage the circuits.

5.2.3 Ink cartridge cautions

a) General cautions

Refer to *a) General cautions on Page 1-34*.

b) Unpacking the ink cartridge

Do not open the ink cartridge packaging unless you are ready to install the new ink cartridge. Before installing it in the BJ cartridge, remove the protective cap from the ink inlet.

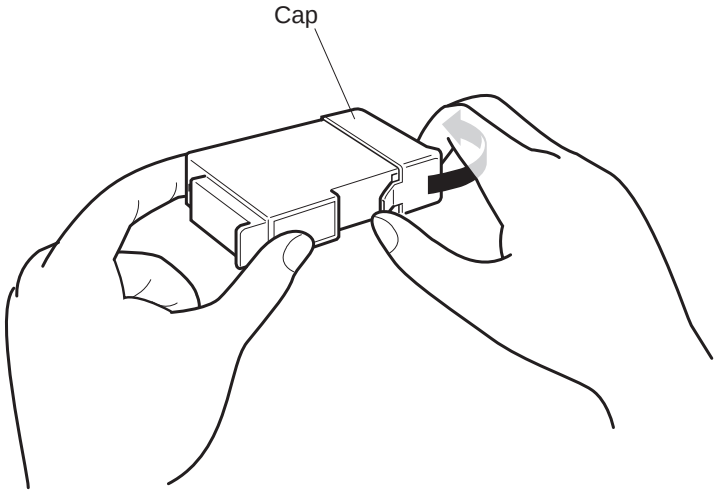


Figure 1-20 Removing Cartridge Cap

c) Preventing ink clogging

Do not touch the ink cartridge's ink outlets. Doing so may introduce foreign matter into the printing head's joint pipes, causing poor ink suction. After removing the cap from the ink cartridge, immediately install the ink cartridge in the printing head to prevent the ink at the nozzles from drying out and clogging. Do not remove the ink cartridge except when it is to be replaced.

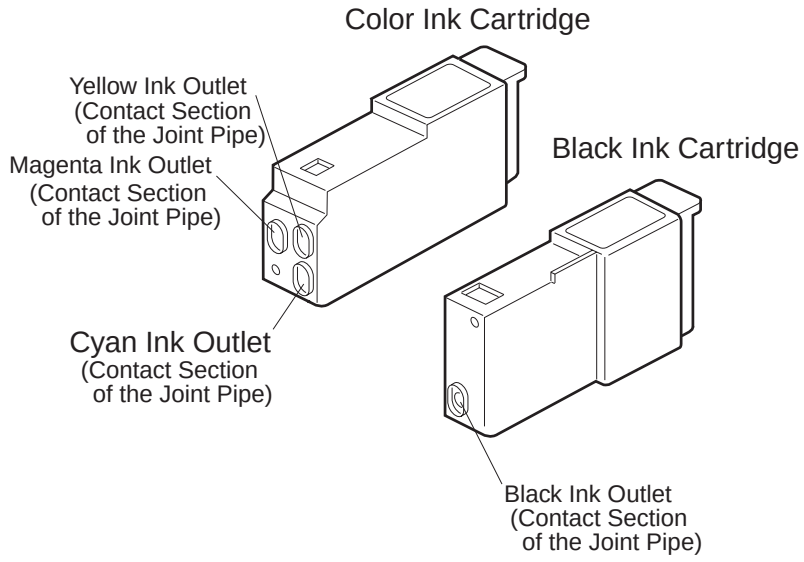


Figure 1-21 Ink Outlet

NOTE

If the ink nozzles are clogged or if the ink suction is poor, the printout may have horizontal white stripes. If the cleaning operation does not restore it to normal, replace the BJ cartridge.

5.3 Servicing Cautions

5.3.1 Damage from static charge

This unit contains contact sensors and printed circuit boards equipped with ROM, RAM, custom chips, etc. These electronic components are susceptible to damage caused by static charge.
When disassembling this unit, take care to prevent static charge.

Static electricity

Static charge can damage electronic components or alter their electrical characteristics. Even plastic tools and hands without grounding wrist straps can generate damaging static charge.

The following items are required to prevent static charge:

- A grounded, conductive mat
- Grounding wrist straps
- A cord with alligator clips to ground this unit's metal chassis

If you do not have any of the above on hand (during on-site servicing), follow the alternate measures below:

- Use a grounding bag to store and transport printed circuit boards and electronic devices.
- Avoid wearing silk or polyester clothing and leather-soled shoes. Wear cotton clothing and rubber-soled shoes instead.
- Avoid servicing this unit in a carpeted room.
- Before servicing this unit, touch this unit's grounded terminals to discharge any static charge.
- Wear grounding wrist straps and ground this unit's metal chassis.
- Always handle the circuit boards and devices along their edges. Do not touch the components and terminals with your fingers.

Shock hazard during power on

If servicing must be performed while this unit is turned on, do not wear any grounding wrist straps. This is to prevent electricity from passing through your body.

5.3.2 Scanner unit

a) General Precautions

- Handle contact sensors with care to prevent scratching or smudging of the scanning surface. Scratches or smudges can cause vertical stripes, etc., to appear on the scanned image.
- Be careful not to scratch the ADF rollers. If the rollers are scratched, paper jams may result.

5.3.3 Print assembly

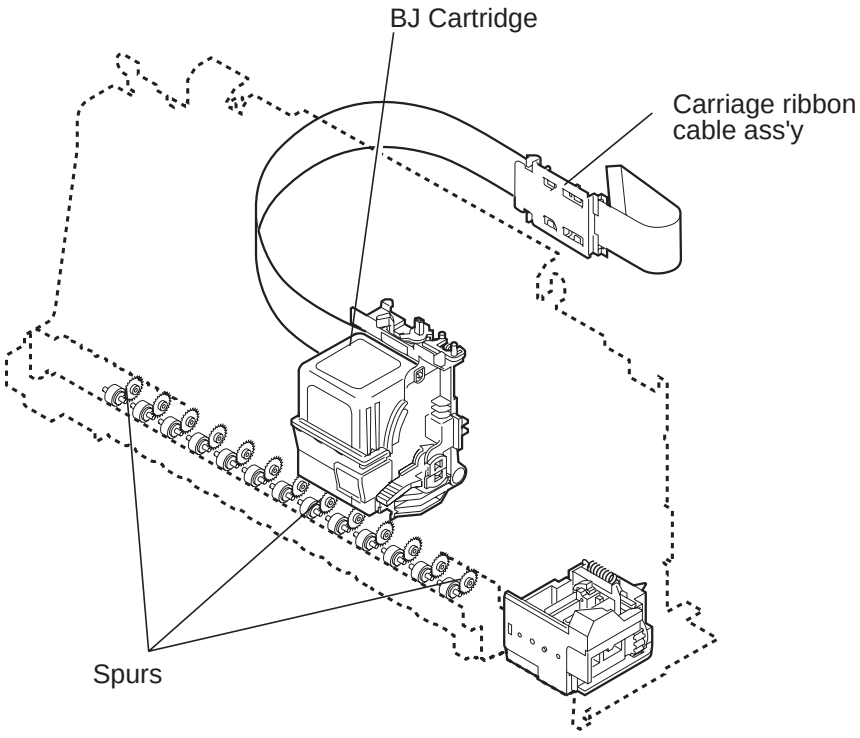


Figure 1-22 Print Assembly Precautions

a) General precautions

Lubrication points

Do not touch the greased parts of the carriage guide frame, carriage shaft, idler roller and some parts. Doing so will wipe off the grease which has been applied for the smooth operation of the printer unit.

Do not apply grease to any unspecified parts and surfaces. If grease is on the purge section's rubber cap or the wiping assembly's blade, it may cause the BJ cartridge's nozzles to clog, rendering the BJ cartridge unusable. Also, do not use any grease other than the specified type. Using a different type of grease may dissolve or deform plastic parts.

NOTE

If you accidentally touch a greased surface, reapply the grease. See the *PARTS CATALOG (provided separately)*.

Spurs

During servicing, be careful not to damage or deform the spur assembly's spur tips. If the spur tips are deformed, the area of the paper coming into contact after the printing increases, causing vertical black stripes on the paper.

Carriage ribbon cable assembly

Do not pull or bend the carriage ribbon cable more than is necessary. Doing so may disrupt the cable's continuity and prevent the printing signals to be sent properly to the cartridge.

Power off during printing

During servicing, do not disconnect the power cord during a printing operation or while the cartridge is being replaced. Otherwise, the cartridge will stop at a position where the ink nozzles cannot be protected by the rubber cap. The ink may then dry and clog the nozzles. During servicing, be sure the cartridge is properly positioned for nozzle capping.

5.3.4 Paper feed section

a) General precautions

Setting the paper size

For fax operations, the user sets the paper size in the PRINTER SETTINGS menu. The unit cannot detect the paper size automatically. Therefore, if the paper size is altered during servicing, be sure to set it back to the user's paper size setting.

If the paper size setting does not match the size of the paper installed. One of the following two operations will be executed:

(A) If the paper size setting is the same or smaller than the actual size of the paper installed, the following will be executed:
The document will be printed to fit the length of the paper size that has been set.
Even if the paper size setting is smaller than the actual paper size, printing will be executed and no error will result. Depending on the document, large blank areas may result on the printout.

(B) If the paper size setting is larger than the actual paper size, the following will be executed:
As with (A), the document will be printed to fit the length of the paper size that has been set. Since the actual paper size is shorter than the paper size setting, the document's contents would be broken up to fit the paper size setting. **"CHECK PAPER SIZE"** will therefore be displayed and printing will be canceled.

5.3.5 Control boards

a) Adjustable volume

- The MODEM board's volume resistor VR1 has been factory-adjusted. Service personnel are not to alter its setting.
- The power supply unit's adjustable volume VR101 has been factory-adjusted. Service personnel are not to alter its setting.

b) Replacing the SPCNT board

The SPCNT board stores the user data, service data, and other data. Therefore, when replacing the SPCNT board, print out the stored data and then enter this data into the new SPCNT board.
The memory of the SPCNT Board retains the data on the amount of waste ink the absorbent has drawn and the data used to correct discrepancies in vertical alignment correction. In the light of this, it is important to generate a system dump list before replacing the SPCNT Board.
Using the list, find out how much waste ink the absorbent has drawn; then, after replacing the board with a new one, enter the data, and correct any discrepancies in vertical alignment correction as necessary.

REFERENCE

The SPCNT board replacement precaution is described in *"5.4.5 SPCNT board replacement precautions" on Page 1-60*.

c) Precautions when attaching/detaching the flat cable

Attaching or detaching the flat cable while the machine is turned ON may cause a short in the connector, resulting in malfunction. Always turn the power OFF before attaching/ detaching the flat cable.

5.3.6 Detaching the outer covers

How to open the upper cover

Unless the correct procedure is followed when removing the upper cover, the outer covers may be damaged, and the plastic claws may be broken. Be sure to use the correct tools for the job. If any of the outer covers are damaged during the work, they must be replaced with new ones.

You will have to use a recommended tool or the like when detaching the outer covers (e.g., connector cover, rear cover, upper cover), i.e., to free claws.

To detach the upper cover, you will need to detach other covers first. Particularly, you will not be able to detach the upper cover unless you have detached the connector cover. (For the locations of the claws, see the following diagram.)

- Use a tool whose diameter is less than that of the holes. (hole:3mm × 1.5mm)
  Using lager diameter tools may damage the surface around the holes.
- Be careful not to cause any damage around the holes.
- When detaching the upper cover, take care not to insert the tool more 20 mm in an attempt to free the claw on the left side. Otherwise, you could damage the flat cable inside the machine.
- When detaching the upper cover, be sure to free it from the lower cover by pulling its front toward the front after freeing the claw with the tool. For details, see the *Figure 1-23 Opening the Upper Cover.*

NOTE

The cover opener (round-tip screwdriver) has been set as a special tool, but any precision screwdriver with a tip diameter of 1.5 mm or less would do instead. If using a substitute, be careful not to scratch any surfaces.

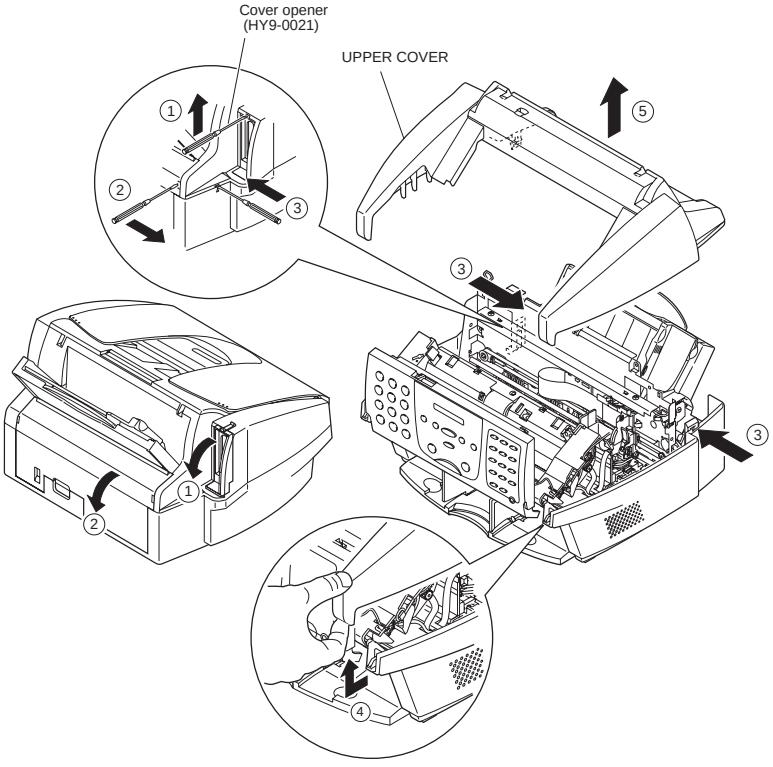


Figure 1-23 Opening the Upper Cover

5.3.7 Attaching the operation panel sheet

The service parts of the operation panel have been selected assuming that the operation panel sheet will be attached to the operation panel unit. As such, if you have to replace the operation panel unit, be sure to purchase an appropriate operation panel unit and an operation panel sheet complying with that unit for attachment.

When attaching the operation panel sheet, butt the sheet against the operation panel unit using the recess in the sheet as a reference; then, smooth out working your hand toward the front.

Attaching the Operation Panel Sheet

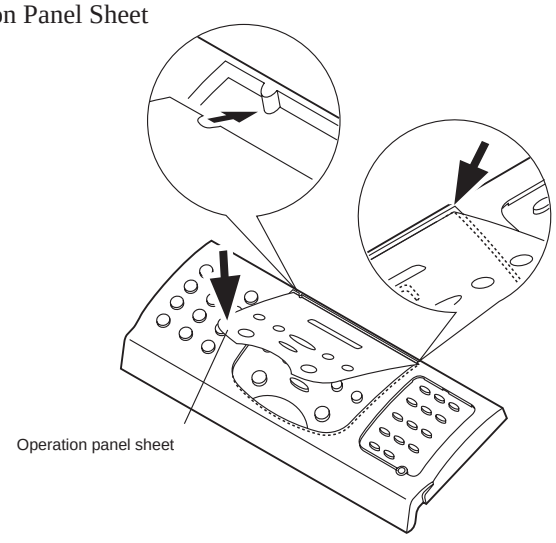


Figure 1-24 Operation Panel Sheet

5.4 Data-related Precautions

The memory IC on the circuit board stores the user's registration data and values for various counters, etc., required for servicing. Although this data is normally retained in memory, it can be deleted by mistake. When handling this data during servicing, note the following precautions.

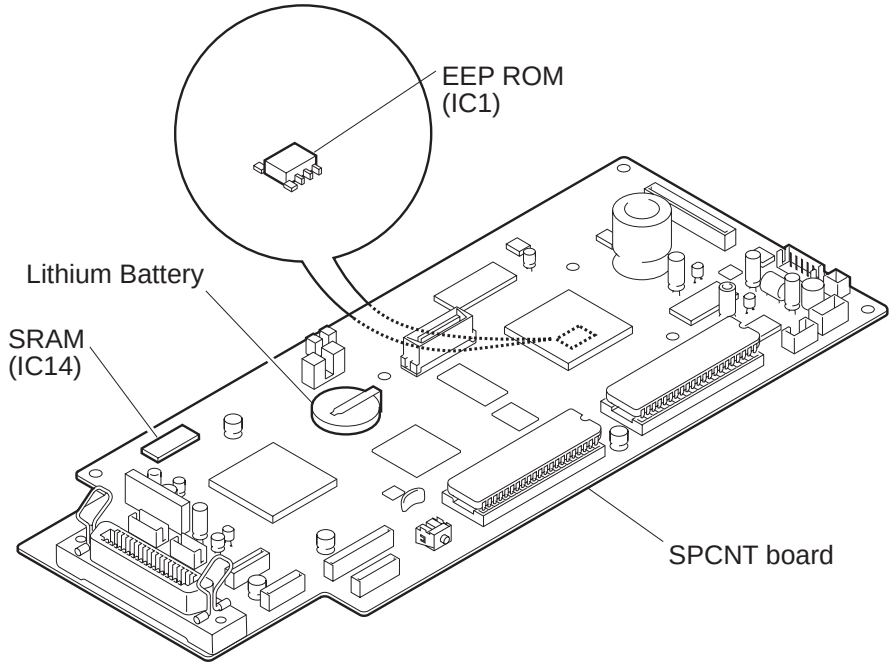


Figure 1-25 Memory IC and Backed up Devices

NOTE

PC registration function

Using the MultiPASS Desktop Manager that comes with this product, the user setting items stored in the SRAM can be reprogrammed. The contents of these items are stored as necessary in the settings files in the PC, and at the same time are rewritten into the user setting items in the SRAM, via bi-centronics interface. This function means that, when replacing the lithium battery, or performing repairs that normally entail the loss of data, if the user's PC contains valid settings files, there is no need to reenter user managed data. Refer to *the MultiPASS Desktop Manager User's Guide* for details of this function. However, please note that service data are not saved.

5.4.1 Data in the image storage memory (DRAM)

DRAM stores image data which was read other than by a direct transmission. It also acts as a buffer memory to store the image data received. If power is turned off, the memory clear list is printed automatically the next time the power is turned on. The user is thereby notified of the images that were erased from memory.

NOTE

Reception image data

This product is not equipped with image data backup, so that if the power supply is cut, data in memory reception will be lost.

When image data are set to be printed, they will be stored in the DRAM as memory reception images, and **"REC'D IN MEMORY"** will be displayed. This product does not have a memory reception image transfer capability. If printing is disabled due to a fault in the printing section, check the Memory Clear List, after turning off the power to repair the fault, and request the other party to retransmit the message.

If the setting is for the received image data to be transferred to PC, instead of being printed, the data will be saved as a file in the DRAM, and **"RECEIVED IN FILE"** will be displayed. To print the contents from the main unit only, press **Memory Reference** button then select **"FILE PRINT"** with the numeric keys. If printing is disabled due to a fault in the printing section, connect to the PC, and start up MultiPASS Desktop Manager. The file will be exported to the PC, and the contents can be verified on the PC display and saved.

5.4.2 Data in the control processing memory (SRAM)

SRAM is backed up by a lithium battery. It can retain the stored data for 5 years after the power is turned off. SRAM stores the following data: All the data the user entered with the menu system, the activity reports and other report-generating data, the redial data containing the redial destinations set with the Redial key, the servicing data set by repair personnel with the service soft switch, and the CS LED lights-on duration data. SRAM stores almost all of the data which can be entered or set.
These stored data can be checked with various reports.

NOTE

Jumper Plug Precautions

The data in the SRAM mounted on the SPCNT Board is retained by means of a lithium battery. However, it is important to keep in mind that, for the SPCNT Board supplied as a service part, the jumper plug (JP3) is not shorted so that power is not drawn, thereby preventing unnecessary consumption of power during storage.
When mounting the SPCNT Board, be sure to remove the shorting plug from one of the two shorting pins, and then put it so as to span the two shorting pins.
Further, for the SPCNT Board that comes originally with the machine, a chip jumper (R90; on the back of the board) is used for shorting instead of a shorting plug; and power is always flowing from the lithium battery of any SPCNT Board that came with the machine. If you want to stop the power for PCB repairs, remove the R90 chip jumper before starting the work; after the work, be sure to solder the chip jumper back in place, and check the voltage of the battery to make sure that it has not been exhausted. If the battery has reached the end of its life, replace it with a new one.

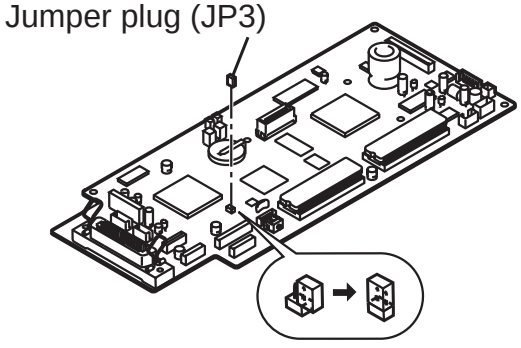


Figure 1-26 Attaching the Jumper Plug

NOTE

Lithium battery life

The lithium battery can last for over 5 years after the power is turned off.
When the power is on, the lithium battery's power is untapped. Therefore, the actual battery life can be much longer.
When the lithium battery becomes exhausted, **"DATA ERROR"** will be displayed after the power is turned off or on. When this happens, replace the lithium battery. Since the data in SRAM will be lost when the battery is replaced, it cannot be printed out.
After the lithium battery is replaced and the power is turned on, **"DATA ERROR"** will be displayed. Press the **Set** button to discard the contents in SRAM and initialize it to the factory defaults.
Refer to *Chapter 3: 3.1 CS LED lights-on Duration Adjustment on Page 3-6* to reset the CS LED lights-on duration.

5.4.3 Data in the EEPROM

The EEPROM stores the absorption amounts of the waste ink absorber and vertical alignment data. The non-volatile EEPROM does not require any electrical power to retain the data it contains.

Calculation of the total waste ink amount of the waste ink absorber starts immediately after the printer is used. When the absorption amount of the waste ink absorber reaches 100 percent, the waste ink full error is generated and the printing operation is stopped to prevent the waste ink from leaking out.

The vertical alignment data is for correcting any vertical misalignment during bi-directional printing.

The data in the EEPROM can be checked or altered.

REFERENCE

Checking or altering the data in EEPROM

Waste ink absorption amount:

To check the amount, use the service report's System Dump List. For details, see *Chapter 3: a-2) System dump list on Page 3-63*.

To enter the amount, use the service data #7 PRINTER 3. INK ABS CAPA. For details, see *Chapter 3: 5.2.5 New SSSW's/parameters added to this model on Page 3-39*.

Vertical alignment data:

To adjust the vertical alignment, see *Chapter 3: 3.2 Vertical Alignment Correction on Page 3-7*.

Re-entering the waste ink absorber's ink absorption amount.

The amount data is calculated waste ink absorber. The waste ink absorption amount displayed in the **SYSTEM DUMP LIST** indicates the percentage of the respective absorber's maximum capacity that has been reached. The percentage can be indicated and entered in 1% increments. When the waste ink generated immediately after the printer is used reaches 100 percent of the waste ink absorber's capacity, a waste ink full error is generated for each absorber and the printing operation is stopped. Therefore when replacing the SPCNT board, be sure to check the current absorption amount and enter it in the new SPCNT board.

If the SPCNT board assembly malfunctions and the current waste ink absorption amount cannot be checked, replace the ink absorber and set the waste ink absorption amount to 0%. To replace the ink absorber, see *d) Recovery methods for codes indicated as "New" on Page 3-22*.

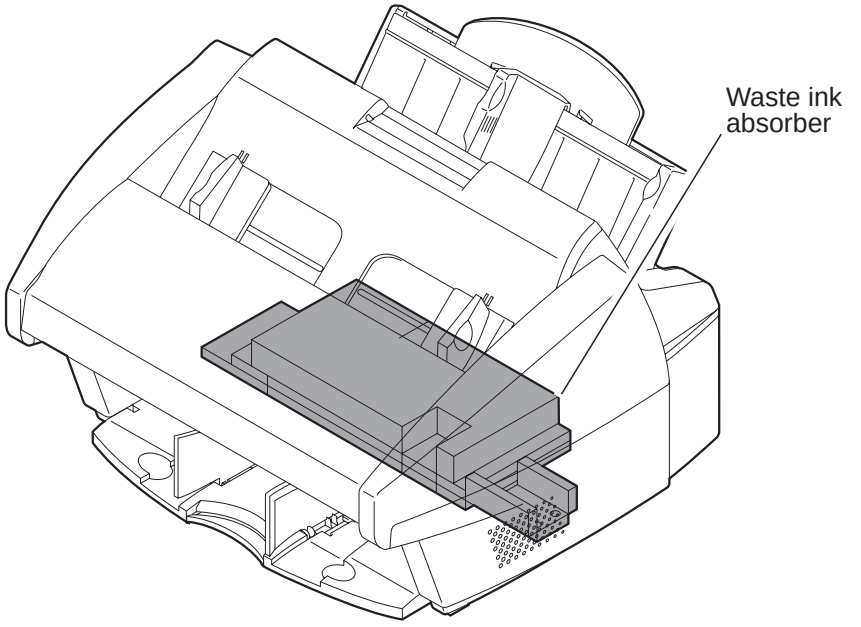


Figure 1-27 Waste Ink Absorber

5.4.4 Replacing ROM

Observe the following precautions when replacing the ROM on the SPCNT board, for example, when replacing a defective ROM or when upgrading the software.

a) Precaution

Print out all battery backed up data.

Reception image data in image memory are erased when power is turned off.

For details on battery backed up data, see *Chapter 1: 5.5.1 Data battery backup function on Page 1-62*.

REFERENCE

b) Replacement

(1) Make sure that the power cord is disconnected.
(2) Put on the grounding wrist straps to counter electrostatic discharge.
(3) Remove the upper cover, referring to *the Parts Catalog (supplied separately)*.
(4) Remove the ROM mounted on the SPCNT board using the ROM extractor etc..
(5) Insert the new ROM, making sure that the notches on the ROM package and IC socket are aligned.

When Replacing the ROM

The machine's SPCNT Board comes in two types: main ROM and printer ROM. If you mounted a main ROM designed for 3.3 V to the socket of a printer ROM designed for 5 V by mistake, you could damage the ROM, requiring extra care during replacement work. Further, be sure to refer to the following diagram whenever you need to mount a printer ROM (42-pin IC socket, 40-pin ROM).

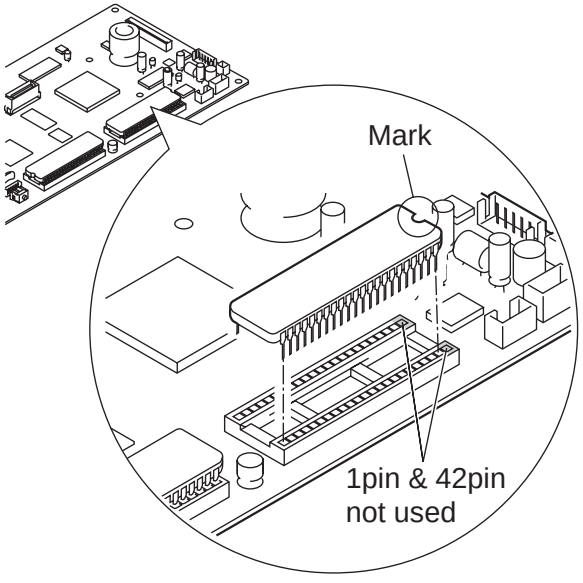


Figure 1-28 Attaching the Printer ROM

c) Post- replacement precautions

(1) When ROM replacement is performed to replace a faulty ROM, service work is completed after reassembling the fax and turning the power ON.

(2) After ROM replacement is performed to upgrade the ROM version and software switches such as service data and user data settings must be changed, following operations must be performed. This is because the pre-replacement settings stored in the memory have been saved by the battery back-up function.

- Perform an ALL CLEAR operation.
  After performing ALL CLEAR, reregister the battery backed-up data which you printed out earlier.

REFERENCE

Refer to *Chapter 3: 3.1 CS LED lights-on Duration Adjustment on Page 3-6* to reset the CS LED lights-on duration.

5.4.5 SPCNT board replacement precautions

Before replacing the SPCNT board, print out all of the stored data.

The reports which output the data that must be entered into the new SPCNT board is listed below.

User report

- **One-touch speed dialing list**
- **Coded speed dialing list**
- **Group dialing list**
- **User data list**
- **Send/Receive Activity report**
- **Document memory list**

Service report

- **System data list**
- **System dump list**

REFERENCE

To printout these reports, see *Chapter 3: 7. SERVICE REPORT on Page 3-58*.
To PC registration function, see *Page 1-53*.

The data in the SRAM mounted on the SPCNT Board is retained by means of a lithium battery. However, it is important to keep in mind that, for the SPCNT Board supplied as a service part, the jumper plug (JP3) is not shorted so that power is not drawn, thereby preventing unnecessary consumption of power during storage.
When mounting the SPCNT Board, be sure to remove the shorting plug from one of the two shorting pins, and then put it so as to span the two shorting pins.

After the new SPCNT board is installed and the power is turned on, **"DATA ERROR"** will be displayed. Press the **Set** button to discard the SRAM's irregular contents and initialize it to the factory defaults.
Refer to *Chapter 3: 3. ADJUSTMENT on Page 3-6* to reset the CS LED lights-on duration and to adjust the vertical line alignment.

Then refer to the report that was printed out beforehand and enter the various data.

5.4.6 Data initialization through service operation

All the data can be initialized with the service data #8 clear operation.

REFERENCE

For details on the initialization procedure and the data that is erased, see *Chapter 3: 5.2 Service Data Setting on Page 3-29*.

NOTE

"All clear" when nothing works.

On a rare occasion, the display may go blank and all the buttons may stop working. Severe electrical noise and static can cause problems as well. In such a case, use the **"All clear"** feature.

After installing the unit for the first time and connecting the power cord, execute **"All clear."** The procedure is described below.

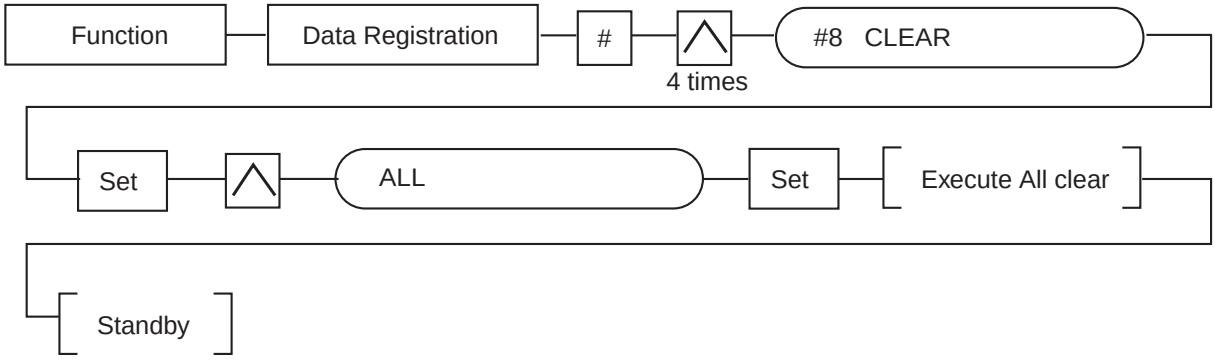


Figure 1-29 All Clear

5.5 Protective Mechanism

5.5.1 Data battery backup function

If there is a power outage or if the power is turned off, the data stored in the control memory is retained since the lithium battery function as a data battery backup.

REFERENCE

For details on the backed up data, see *Chapter 1: 5.4 Data related precautions on Page 1-53*.

5.5.2 BJ cartridge maintenance features

a) Cleaning

To maintain high printing quality, the fax unit has a cleaning feature that wipes off dust from the BJ cartridge nozzles with a head wiper and fills the nozzles with fresh ink.

b) Nozzle capping

The fax unit caps the BJ cartridge nozzles with the Capping section cap after the carriage returns to the front of the Capping section on the right side. This protects the nozzles from dust and prevents the ink from drying out or leaking.

c) Maintenance jet

The fax unit has a maintenance jet feature which purges ink from all the ink cartridge nozzles to the purge unit. This prevents the nozzles from clogging and ensures high printing quality.

5.5.3 Heat protection mechanism

The BJ cartridge head's aluminum panel becomes hot during printing. It also gets hot if printing continues even after the ink in the cartridge has been depleted. The aluminum panel's temperature is detected by the BJ cartridge's head temperature sensor.

- **When the carriage is to be moved to the cartridge replacement position, the following applies:**

  If the detected temperature exceeds 50°C, **"WAIT COOLING"** is displayed and the carriage does not move. This is to prevent the user from touching the BJ cartridge's aluminum panel. After several minutes when the temperature decreases, the cartridge replacement procedure must be executed again.
- **When a temperature exceeding the standard temperature is detected, the following applies:**

  During printing, the printing head temperature is monitored every 50 ms. If the printing head temperature exceeds 75°C, a 3.5-second wait period is inserted after each printed line for 20 seconds. This is to allow the printing head to cool. After 20 seconds, the head temperature is checked. If the temperature has dropped below 75°C, normal printing resumes without any wait period inserted. However, if the head temperature is still above 75°C, the wait period is inserted after each printed line until the printing head cools sufficiently.

If a head temperature exceeding 100°C is detected for 0.2 sec. during printing, it will be deemed as a BJ head abnormal temperature error and **"CHECK PRINTER ##336"** will be displayed. The printing operation will also stop.

If a head temperature exceeding 100°C is detected for 1 sec. during printing, it will be deemed as a BJ head temperature sensor error and **"CHECK PRINTER ##337"** will be displayed. The printing operation will also stop.

5.5.4 Overcurrent protection

The fax unit has an overcurrent protection circuit with a built-in fuse to prevent an abnormal temperature increase if an overcurrent flows to the motors and power supply due to a driver IC problem, software lockup, or short circuiting.

Protected Component	Safety Device
Document feed motor	IC protector (FU3) on SPCNT board
Paper feed motor	IC protector (FU2) on SPCNT board
Carriage motor	IC protector (FU1) on SPCNT board
Power supply unit	Current fuse (250V, 2.5A), overcurrent protection circuit

5.5.5 Lightning protection

The fax unit's electrical components are protected from abnormal voltage caused by lightning.

Protected Component	Safety Device
SPCNT/NCU board assembly	Arrestors (AR1, AR2) on the primary side of the NCU board discharges a voltage over 320 to 480 VDC via the power cord

NOTE

When protection is not possible

The SPCNT board may not be adequately protected even with the protection circuits if lightning strikes the telephone line.

5.5.6 Power leakage protection

The AC line, telephone line, and metal parts of the fax unit are completely insulated. The fax unit has a grounded power cord (three-prong plug) to prevent electrical shock. If power leakage does occur, use the fax unit only with a grounded electrical outlet supplying the proper voltage.

6. QUALIFICATION REQUIRED FOR INSTALLATION WORK

The qualifications for installation must satisfy local laws and regulations.

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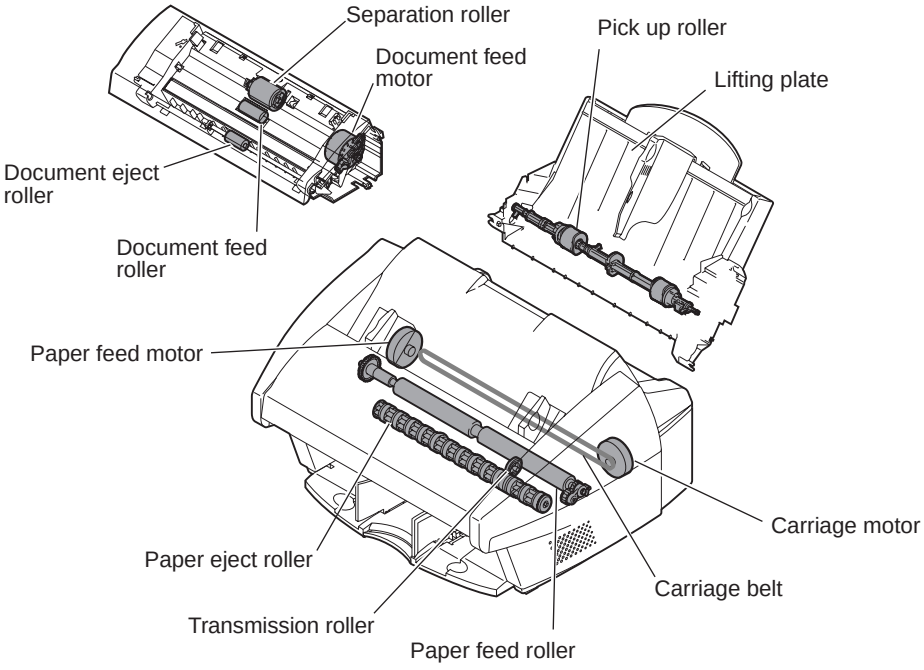
1. COMPONENT LAYOUT

The mechanism is composed of the Document Feed Section, which separates pages from a stack of documents and feeds them in one at a time to the Scanning section; the Paper Supply Section, which supplies separated paper or special paper to the Printer Section, and ejects them to the paper tray after printing; and the Printer Section, which performs cleaning of the BJ head, and printing to paper.

For details on each Section of the mechanism, see the sections below, beginning with *2. SCANNER MECHANISM on Page 2-3*.



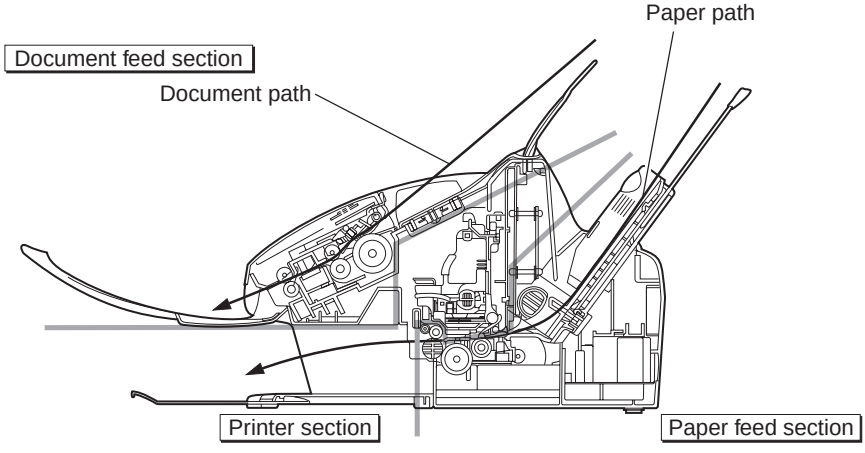
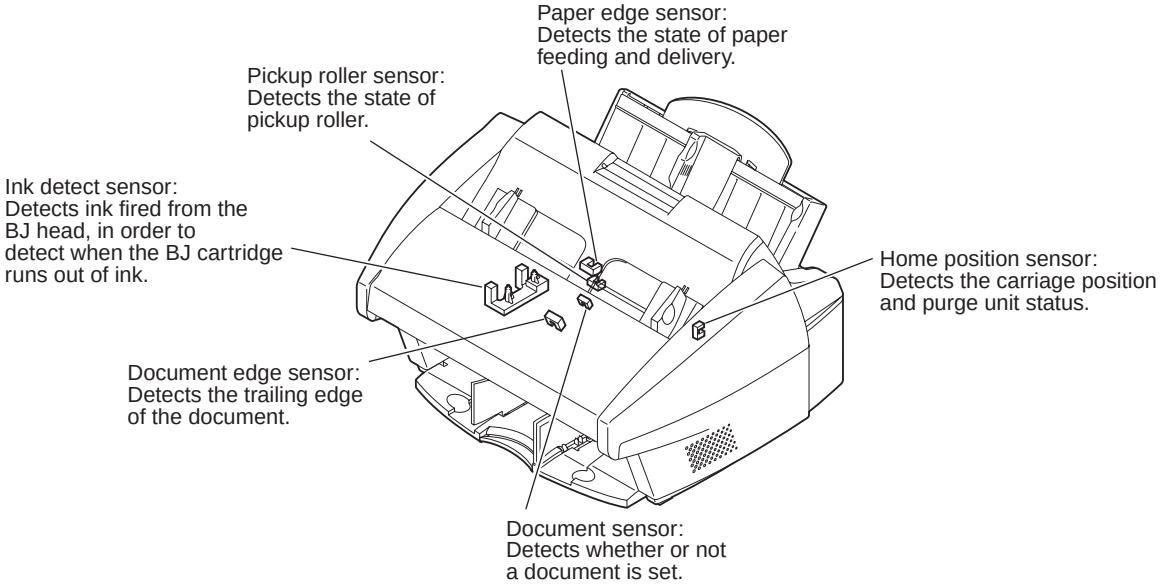


Figure 2-1 Mechanical Layout

The electrical section is composed of the following: the SPCNT board, which performs system control and BJ printer control; the NCU board, which is the interface with the telephone circuit; the power supply unit; and the OPCNT board, which detects key operations and displays status information. There are also 6 sensors to detect system status.


Paper edge sensor:
Detects the state of paper feeding and delivery.
Pickup roller sensor:
Detects the state of pickup roller.
Ink detect sensor:
Detects ink fired from the BJ head, in order to detect when the BJ cartridge runs out of ink.
Home position sensor:
Detects the carriage position and purge unit status.
Document edge sensor:
Detects the trailing edge of the document.
Document sensor:
Detects whether or not a document is set.

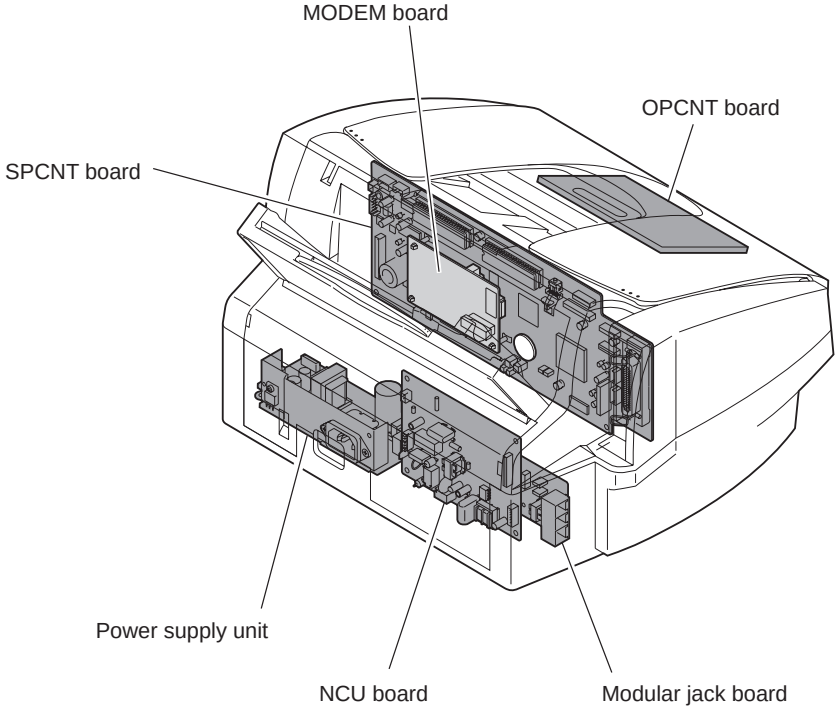


Figure 2-2 Electrical System Layout

2. SCANNER MECHANISM

The scanner section scans documents that are to be sent or copied.

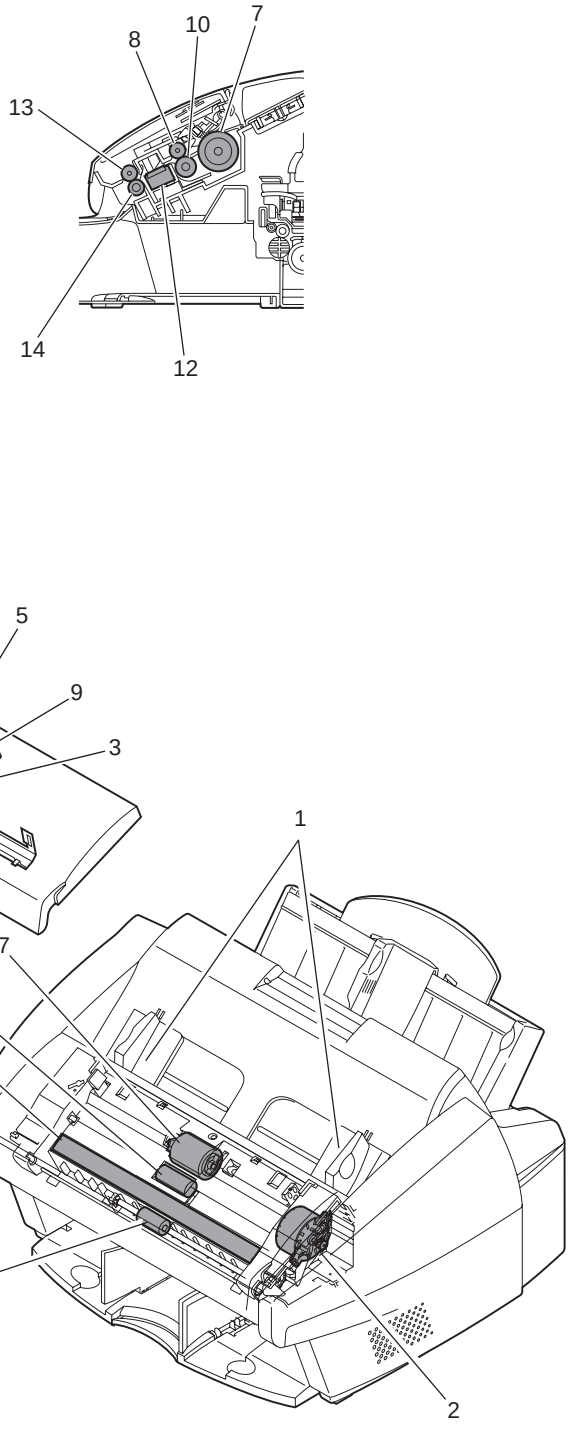


Figure 2-3 Document Feed Section

Names and functions of parts

1. Paper Guide

When properly adjusted to the width of the documents, the guide will hold the documents in the horizontal direction to prevent them from skewing when fed.

2. Document Feed Motor

This motor drives all the rollers in the scanner section.

3. Document Sensor (DS)

This sensor uses an actuator to detect the presence of documents to be scanned, and sends that information to the SPCNT board by way of the gate array in the operation panel unit.

4. Document Stopper

This stopper is located to the side of the separation rollers, and prevents documents from entering too far inside the scanning section. This stopper is located here to improve document loading and prevent double feeding or non-feeding due to defective loading of documents.

5. Separation Guide

Separates the documents to prevent double-feeding.

6. Document Feed Lever **→ See next page.**

This lever switches between automatic document feed and manual document feed. Damage to the document caused by the separation roller can be minimized by switching to the manual document feed position when sending single sheets such as thick-stock paper or photographs.

7. Separation Roller

This roller uses differences in the coefficients of friction of the separation guide, document and separation roller to separate each of the sheets in a multiple-page document.

8. Upper Document Feed Roller **→ See next page.**

When the separation roller starts to rotate, the upper document feed roller raises the document stopper so that documents can be fed.

9. Document Edge Sensor (DES)

Using an actuator, the DES detects the edge of a document just before it reaches the contact sensor, and sends this information to the SPCNT board.

10. Document Feed Roller

This roller feeds documents to the color contact sensor after they are separated by the separation roller.

11. White Sheet

This white sheet is used as a whiteness reference when pre-scanning documents.

12. Color contact Sensor **→ See page 2-32.**

The color contact sensor scans the image data from the document, converts it to serial data, and transmits it to the SPCNT board as electrical signals. The color contact sensor has a scanning resolution of true 300 dpi and outputs Red, Green and Blue analog image data.

13. Upper Document Eject Roller

Holds the document between the document eject rollers, and then ejects it.

14. Document Eject Roller

This roller ejects documents fed from the document feed roller.

15. Static Eliminator Brush

Removes static electricity which may have built up on the document in the scanning process, and guards against roller jams.

NOTE

Initializing the upper document feed roller

When the separation roller starts to rotate, the position of the upper document feed roller is simultaneously initialized to raise the document stopper. Initialization is carried out when the power is turned ON, when documents are inserted and when documents are ejected.

Document feed lever

Switching between automatic document feed and manual document feed is carried out by the document feed lever above the left side of the LCD. During automatic document feed, documents are gripped between the separation guide and the separation roller. Switching the lever to manual document feed raises the separation guide and frees it from the document. Manual document feed can therefore minimize the possibility of damage caused by pinching between the separation guide and separation roller when feeding documents such as thick-stock paper or photographs. However, because document separation does not occur in manual document feed mode, only one sheet at a time may be loaded. Loading multiple sheets will result in double feed.

Document feed error detection

There are three types of document feed errors which may occur.

a) Feed jam error

When the leading edge of the document is not detected by the document edge sensor (DES) within 15 seconds after the start of document feed, a feed jam error is detected and document feed is terminated.

b) Document extraction error

When a document is extracted after document feed has started but before the DES is turned on, a document extraction error is detected, and feeding is terminated.

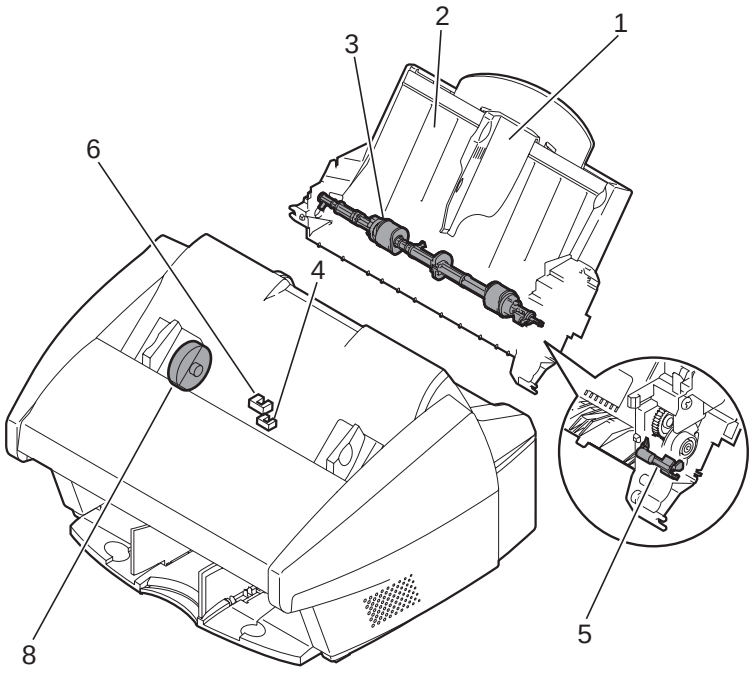
c) Eject jam/document too long error

When the trailing edge of the document is not detected within one meter of feeding after the document's leading edge is detected, an eject jam/ document too long error is detected and feeding is terminated.

When one of these types of jams occurs, all data which have been read and stored in memory (which are not part of a page that has already been completely transmitted or copied) are erased.

3. PAPER SUPPLY MECHANISM

The paper feed mechanism in this model is taken from the BJC-4400 BJ printer. This printer has no paper selection lever on automatic sheet feeder. If paper meets specifications, it can be fed without selecting operation the paper type.



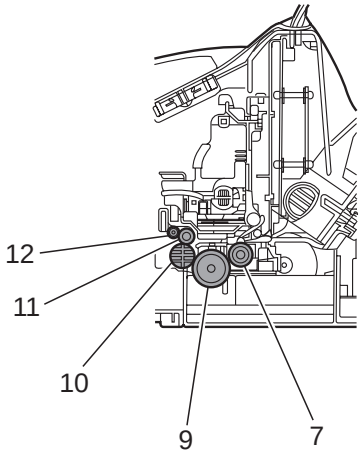


Figure 2-4 Paper Feed Section

Names and functions of parts:

1. Paper guide

The paper guide which slide manually is fixed align with the left side of the paper, to prevent skew.

2. Lifting Plate

This plate moves upwards by the force of the springs and the release cam mechanism, lifting the paper stack until it touches the Pickup Roller. After separation, it moves back down to its original position.

3. Pickup roller → **See Page 2-8.**

The pickup roller has a semi circular roller. This roller is rotated once, and sends the paper once sheet at a time, as a result of corresponding operation with the lifting plate.

4. Pickup Roller Sensor (PRS)

This sensor monitors the initial position of the Pickup Roller position.

5. Paper Separator → **See Page 2-9.**

The paper separator catches the corner of the recording paper or envelope, and holds the extra paper back.

6. Paper Edge Sensor (PES)

This sensor monitors the paper feed state, and detects jams and misfeeds.

7. Paper Feed Roller → **See Page 2-8.**

The Paper Feed Roller transports paper, which has been picked up by the automatic sheet feeder, to the printing position in the Printer Section. It then feeds the paper one line at a time, in coordination with the carriage movement.

8. Paper Feed Motor → **See Page 2-8.**

The Paper Feed Motor drive the paper supply mechanism and purge unit.

9. Transmission Roller

The transmission roller transmits the driving force of the paper feed roller to the paper eject roller.

10. Paper Eject Roller

A roller used to eject the paper.

11. Spur

This spur is used to transport the printed paper properly, without damaging its printed surface. It is shaped so as to make it difficult for ink to stick to it.

12. Cleaner Roller

A roller which cleans the spur when dirtied with ink.

NOTE

Paper feed motor drive switching

Power from the paper feed motor is switched for separation and feed of the paper, and nozzle cleaning mechanisms by the direction of paper feed motor rotation, the slide lock pin on the purge unit and swing gear. When the carriage moves in front of the purge unit, the carriage pushes the control pin, and releases the swing gear driven by the paper feed motor. When the paper feed motor rotates in the paper feed direction in this state, the swing gear rotates and moves up to the auto sheet feeder drive gear to drive the auto sheet feeder. Alternately, when the paper feed motor rotates in the reverse direction, the swing gear rotates and moves up to the purge drive gear to drive the purge unit.
When the control pin is locked, the paper feed roller is driven to feed the paper.

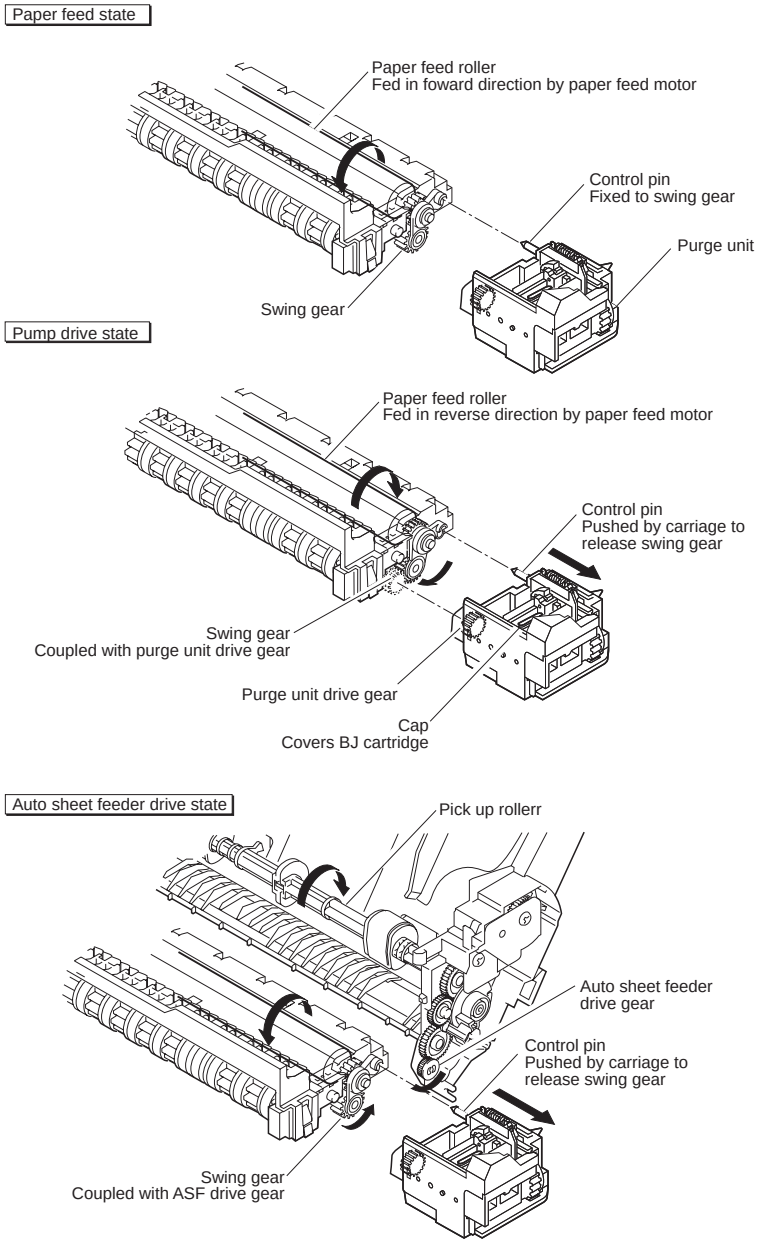


Figure 2-5 Paper Feed Motor Drive Switching

NOTE

Paper Separation Mechanism (Automatic feed)

This model has no paper selection lever on the automatic sheet feeder.

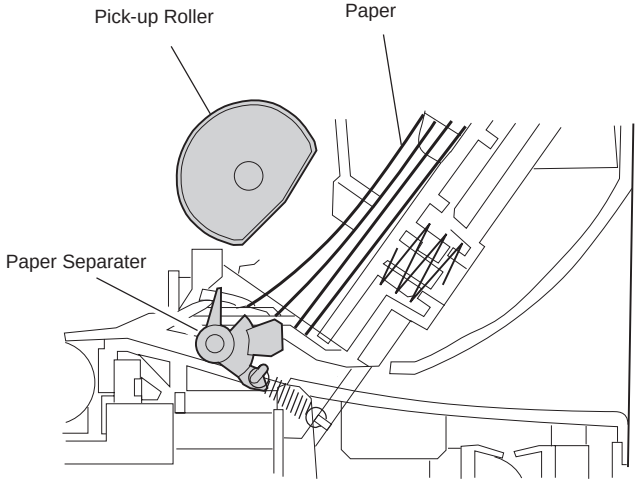
If the paper meets specifications, it can be fed without selecting operation the paper type.

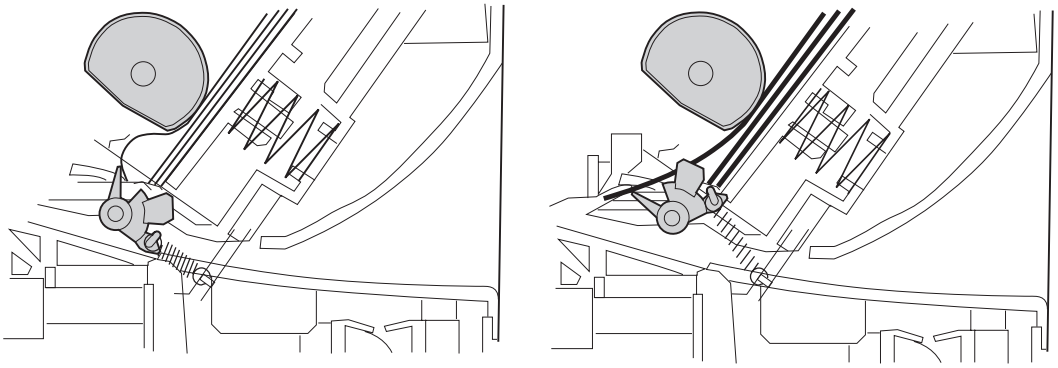
The paper is loaded in the auto sheet feeder such that a corner of it is caught by the paper separator. When printing starts, the pick-up roller starts to rotate through the drive of the paper feed motor. Plain paper is fed with its corner held by the paper separator, and then pushed into the paper feed section. When printing on thick paper like envelopes, as the paper is stiffer than the return force of the paper separator's spring, the paper separator is pressed down to feed the paper.

Initial position of the pick-up roller is detected when the flag is sensed by the pick-up roller sensor on the SPCNT board.

When the paper is sensed by the paper edge sensor for over a second, it is fed automatically until it reaches the starting position for printing.

If the paper is not sensed even when the paper pick-up operation is executed, it is executed again. If the paper is still not sensed, it is assessed as a paper feed error.





<Plain paper pick up.> <Thick paper pick up.>

Figure 2-6 Paper Separation Mechanism

NOTE

Paper feed error detection

There are three types of paper feed error which may occur:

a) No paper error

Occurs when the Paper Edge Sensor does not detect the paper's leading edge the start of the paper picked up operation is executed, it is executed again. If the paper is still not sensed , it is assessed as a No paper error.

b) Eject delay jam

Occurs when the Paper Edge Sensor does not detect the paper's trailing edge after the page has been printed, or after 22 inches (558.8 mm) of paper eject operation has been performed.

c) Paper size error

When the size of the paper being fed is different from that registered in the user data, and the page being printed is divided during printing, a paper size error will occur.

When a paper feed error occurs, memory reception begins from the page at which the paper feed error occurred.

When copying, the data are erased from memory as soon as an error occurs.

4. PRINTER SECTION

The printer section mechanism in this model is taken from the BJC-2000 BJ printer.
Major changes are as follows.

- The spur attachment location has been changed.
- An ink detection sensor has been added.

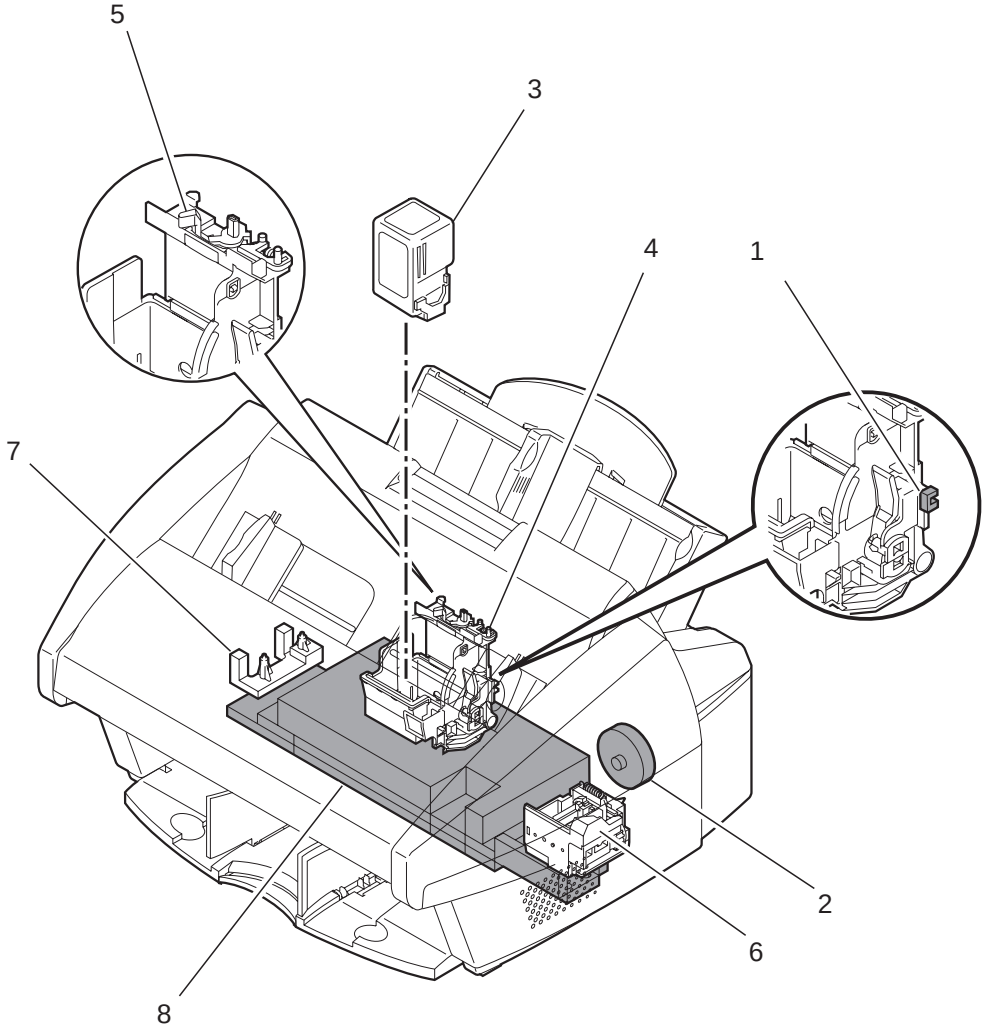


Figure 2-7 Printer Section

Names and functions of parts

1. Home Position Sensor (HPS) → See Page 2-13.

This sensor detects the home position edge and carriage position. Also, at the capping position, the on/off of purge sensor flag during the pump operation is detected.

2. Carriage Motor

This is a stepping/pulse type motor, which is controlled with pulse width modulation. It moves the carriage by belt drive.

3. BJ Cartridge → See Page 2-18.

4. Carriage

Driven by the carriage motor, the carriage moves horizontally across the paper. Through the carriage ribbon cable, the printing signals from the logic board are transmitted to the BJ cartridge in the carriage.

By controlling the purge unit's slide lock pin, the carriage controls the engagement of the paper feed motor's drive power between the paper feed/purge unit and the sheet feeder.

5. Paper thickness adjustment lever

Adjust the gap between the print head and paper according to the thickness of the paper.

6. Purge unit → See Page 2-13.

In order to maintain the BJ cartridge's high print quality, the BJ cartridge's nozzles and spray orifices are cleaned by a wiper and pump. When in standby mode, the BJ cartridge's spray orifice section is covered by a rubber cap to prevent the nozzles from drying out and ink from leaking.

The purge unit controls the swing gear. This gear switches power from the paper feed motor for separation of the paper, paper feed and nozzle cleaning.

7. Ink Detection Sensor → See Page 2-16.

Ink is ejected directly over the optical axis of a pass-type photosensor, which detects the change in light intensity to determine whether or not ink is being ejected.

8. Waste ink absorbers

Absorb waste ink from cleaning or ink empty detection.

NOTE

For details on BJ cartridge holding, carriage drive and pump operation state detection, see the *FACSIMILE BASIC•INTER SUPPLEMENT 2 (supplied separately).*

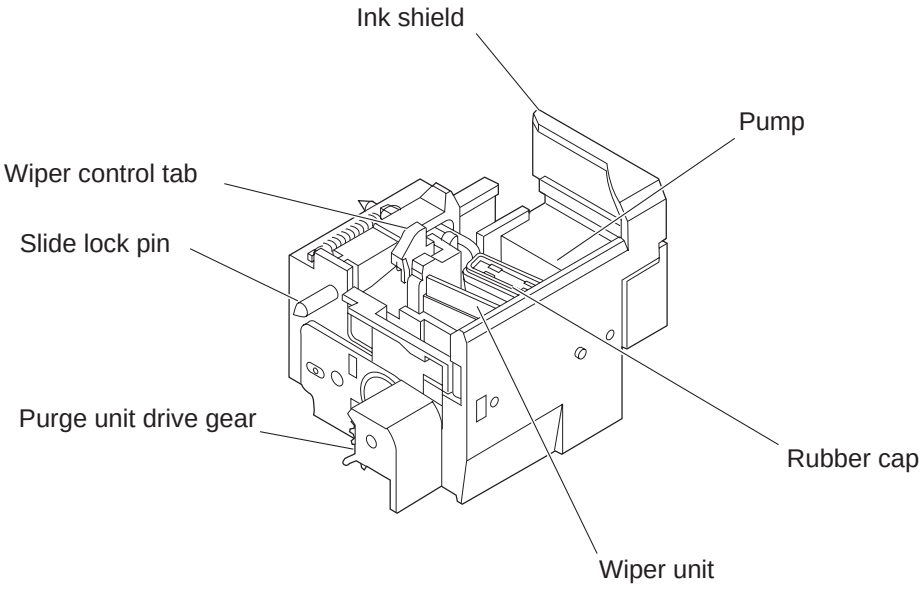


Figure 2-8 Purge Unit

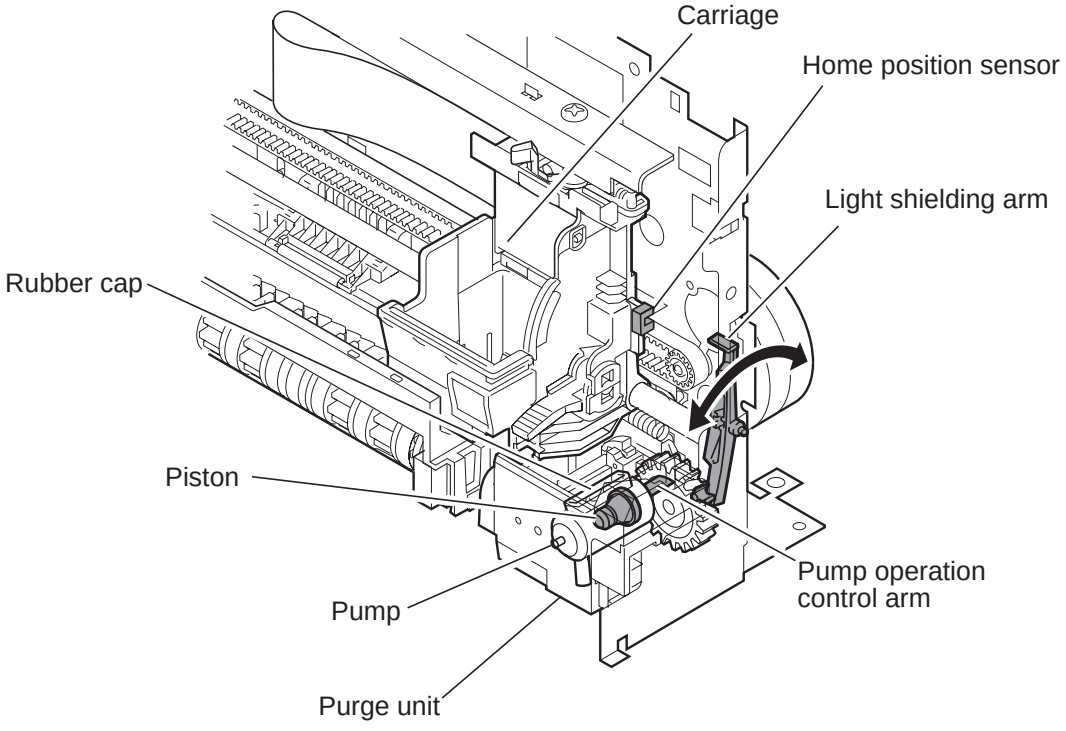


Figure 2-9 Pump Operation State Detection

NOTE

BJ head protection

In order to always maintain good print quality, this model performs cleaning of the BJ head at appropriate times.

There are three types of cleaning operations: pump suction, wiping, and maintenance jet. Also, the print head is capped after printing, to preserve the head.

- **Cleaning operation (pump suction)**

  Cleaning operation is performed using the cap and pump of the purge unit.

  The cleaning operation is performed at the following times:
  - When the user initiates a cleaning operation
  - At power-on
  - When the BJ cartridge is changed
  - At the start of a print operation when at least 72 hours has passed since the last cleaning
    (However, when using the BC-21e/BC-22e, the first cleaning after changing the BJ cartridge/ink cartridge will occur when a print operation begins after 24 hours or more.)

- **Wiping operation**

  When the carriage passes by from left to right, the wiper blade drops down so that it does not touch the print head. When the carriage passes by from right to left, the blade rises to contact the print head and wipe away paper fibers and ink residue.

  The wiping operation is performed at the following times:
  - At the start of printing when less than 72 hours has passed since the last cleaning operation
  - Every 60 seconds during printing (or after a fixed number of dots have been ejected)
  - During a capping operation

- **Maintenance jet**

  The maintenance jet operation prepares the nozzle spray orifice ink surface shape by performing an ink test, firing at the maintenance jet absorber.
  The maintenance jet operation is performed during a cleaning operation, after a wiping operation, and after a fixed time (BC-20: 12 seconds; BC-21e/BC-22e: variable, between 5 and 20 seconds) while printing.

- **Capping after print completion**

  The capping operation is performed at the following times:
  - When a fixed amount of time passes after the completion of printing without new print data being received by the Printer Section
  - During printing, after the second wiping operation (i.e. after 120 seconds) with no print data received by the Printer Section
  - After changing the BJ cartridge

NOTE

Print Shift Correction

Print gaps can occur when doing bidirectional printing, due to changes in the weight of the BJ cartridge and mechanical errors. This gap is corrected by adjusting the carriage drive motor load and the carriage position, which is determined logically from the number of stepping pulses. Gap detection is performed before the start of printing, during the home position detection operation.

NOTE

Ink empty detection

Ink empty detection during fax operation is performed by firing ink between the light source and receptor of the ink sensor, located on the left side of the printer. This function does not work with the BC-22e, only with BC-21e or BC-20.

When ink passes between the source and the receptor, as shown in *Figure 2-10*, the sensor output will be a pulse waveform. The presence of ink may be determined from the pulse generation time.

Ink empty detection is performed at the end of each received page of printing. If ink is not detected on the first detection attempt, the ink nozzle is shifted slightly, and the detection operation is repeated to double-check the first detection operation. If it is determined that there is ink remaining, the image data for that page will be erased from memory. If the cartridge is out of ink, the message **"REPLACE CARTRIDGE"** (with BC-20) **"BLACK INK EMPTY"/"COLOR INK EMPTY"** (with BC-21) will be displayed to inform the user that the cartridge is out of ink, and the page will be "received" to memory again from the image data.

Method of Remaining Color Ink Detection

The method for detection of remaining color ink is the same as that for the detection of remaining black ink. Sensor output is changed by passing each color (Cyan, Magenta, Yellow) in front of the ink sensor after the received image is printed. By counting the time of this change, the presence or absence of ink is detected. The sensor output also changes according to color, so the threshold value of the sensor is adjusted so that it can be reliably detected as normal. If one of the CMY colors is detected to be absent, **"COLOR INK EMPTY"** displays, informing the user that there is no more ink. When color ink has run out, the image is not printed as a BW image, no matter whether there is black ink available or not.

The timing of the check for remaining volume of color ink is only either after the cartridge replacement button is pressed, or when a received image is automatically output. Also, when the BC-22e cartridge is being used, the check for remaining volume of color ink is not performed when copying is done, when PC printing is done, or in corresponding circumstances.

The detection level of the ink detection sensor is adjusted automatically by means of a feedback circuit, and thus requires no manual adjustment. If the sensor output does not reach a standard level, even after performing feedback control (such as if the receptor is completely blocked, or if a sensor defect occurs), the ink sensor failure will be reported with the display of the **"CHECK PRINTER"** (error code ##348) message.

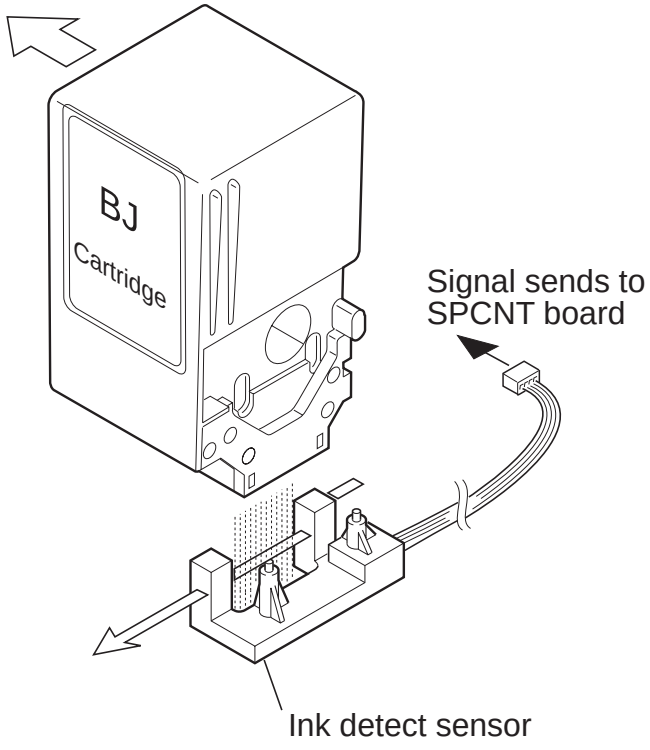


Figure 2-10 Ink Empty Detection

NOTE

Waste Ink Absorbers

This model has a single ink absorber which absorbs waste ink as follows.

- Suction waste ink
  Waste ink sucked from the cap
- Maintenance jet waste ink
  Waste ink from the test firing used to adjust the nozzle condition
- Ink detection waste ink
  Waste ink fired to detect the presence of remaining ink during fax receipt

The amount of ink absorbed is counted as a total of all of these. When the counted absorption levels reach 100%, the **"CHECK PRINTER"** message (error code ##342) will be displayed, and printing will stop to allow the absorber to be changed. To clear the error, it is necessary to replace the absorbers and to reset the waste ink absorption level counts. The waste ink absorber should be replaced after this. For the method of resetting the waste ink absorption level counts, see *Page 1-56.*

5. BJ CARTRIDGE

This model accepts three types of BJ cartridges, the BC-20, BC-21e and BC-22e.

5.1 Structure

a) BC-20 Black BJ cartridge structure

The black BJ cartridge contains a 360 dpi × 128 nozzle bubble jet print head unit, on-demand thermal ink jet type, containing 44 ml of ink. The black ink contained in the ink sponge is filtered with a meshed ink filter to remove dust, and sucked into bubble jet print head unit through a joint pipe.

b) BC-21e Color BJ cartridge structure

The color BJ cartridge has a printing head equipped with 360 dpi/720 dpi × 136 nozzles through which the four ink colors are ejected (24 nozzles each for yellow, magenta, and cyan; 64 nozzles for black). The ink cartridge (one for black and one for the other three colors) are removable and replaceable. The BCI-20 black ink tank contains 9 ml of black ink. The BCI-21 color ink tank contains 5 ml each of yellow, cyan, and magenta ink.

When drop modulation technology is used, small dots are printed in low density areas to minimize the graininess and large dots are used for high density areas. Using this technology allows the printer to retain its printing speed and achieve high quality printing.

c) BC-22e Photo Color BJ cartridge structure

The photo color BJ cartridge has a printing head equipped with 360 dpi × 136 nozzles through which the four ink colors are ejected (24 nozzles each for yellow, magenta, and cyan; 64 nozzles for black). The BJ cartridge contains 9 ml of black ink , 5 ml each of yellow, cyan and magenta ink. Adopting drop modulation technology, the photo BJ cartridge prints small dots in low density areas to minimize the graininess and large dots in high density areas to retain its printing speed and achieve high quality printing.

NOTE

For details on the structure of the Bubble jet head unit structure (Printing mechanism), INKSAVER (economy) printing, and maintenance jet, see the *FACSIMILE BASIC•INTER SUPPLEMENT 2 (supplied separately).*

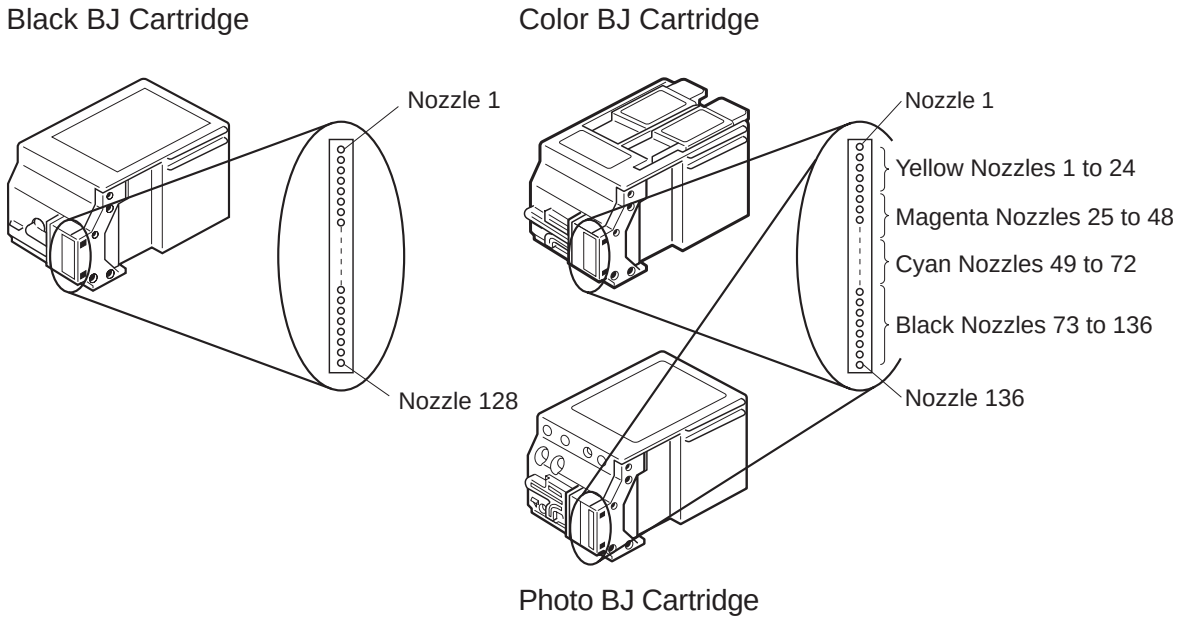


Figure 2-11 Nozzle Arrangement

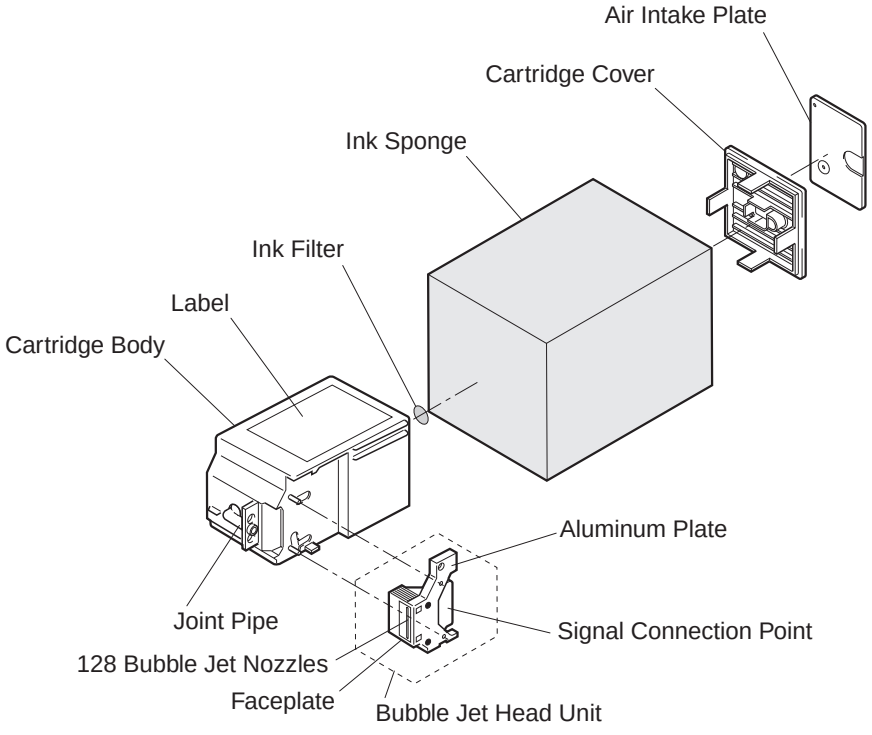


Figure 2-12 Black BJ Cartridge Structure

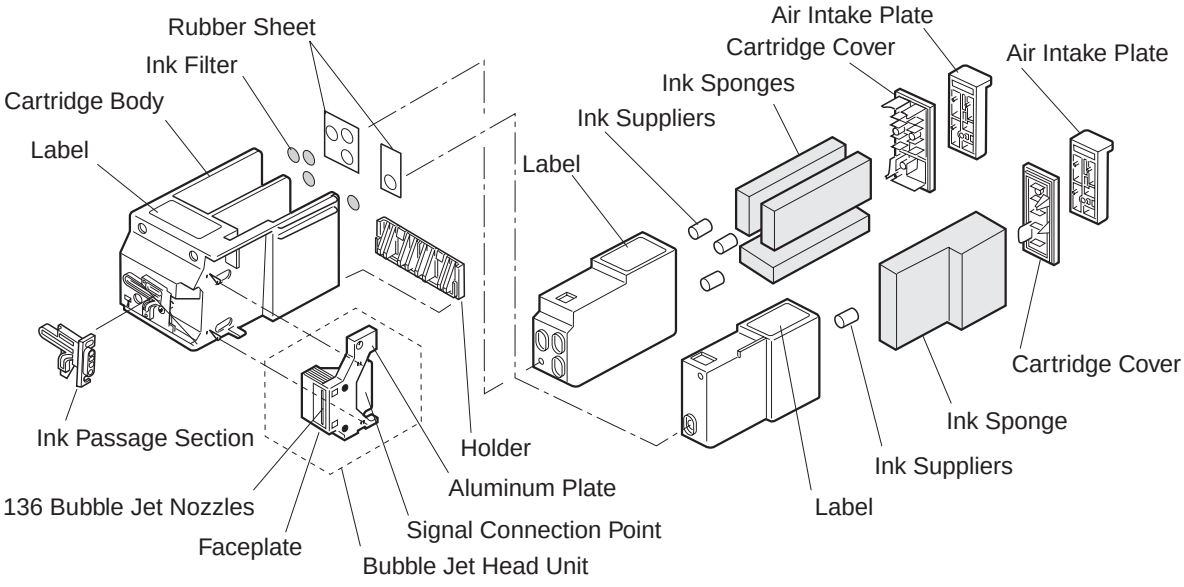


Figure 2-13 Color BJ Cartridge Structure

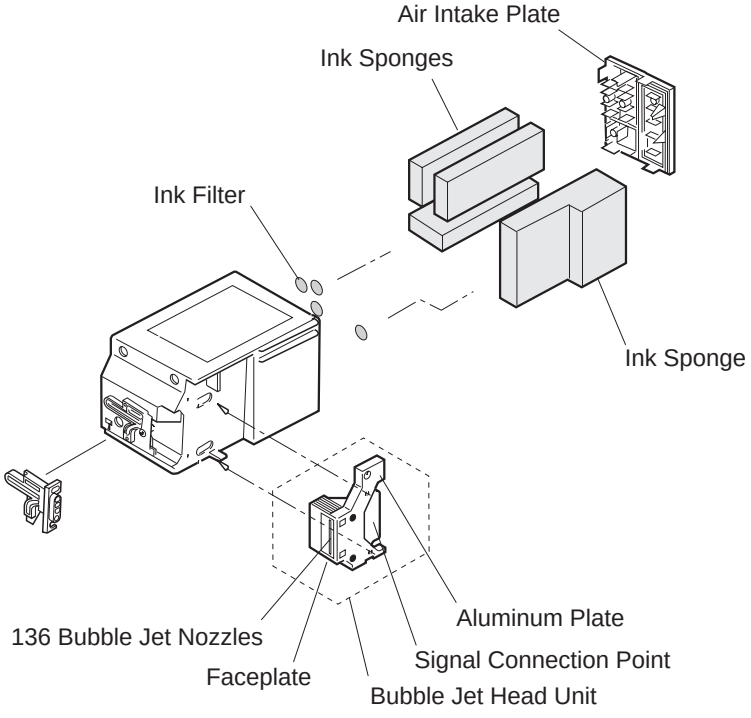


Figure 2-14 Photo BJ Cartridge Structure

5.2 BJ Head Driver Block Diagram

• 128/136 bit shift resistor

Stores the printing data (HDATA) transferred from the control board at HCLOCK's timing.

• 128/136 bit latch

Latches the printing data (HDATA) converted by the 128/136 bit shift resistor.

• Block enable decoder

After the BENB (Block enable) 1, 2, and 3 code signals are input, the specified heat timing signal is output. The heat timing signal is divided into eighth.

• Heater (1 to 128 and 1 to 136)

The heater generates the bubbles required for the nozzles to eject the ink. The heater heats the bubble jet nozzles. Heating is executed with the timing signal produced by the block enable decoder and the even nozzle heat enable (EvenENB), odd nozzle heat enable (OddENB), and heat enable (HENB0 to 3) signals.

• Sub heater

This heater maintains the optimum conditions in the nozzle for ejecting ink.

• Temperature control heater

This heater controls the head temperature to stabilize the ink ejecting amount.

• Rank resistor

To execute optimum heat control of each BJ cartridge, production-related deviation in heater characteristics is classified into 13 types which are identified by changing the rank resistance. From the printer MPU's analog port, the printer MPU detects the different rank resistance as voltage values and converts them from analog to digital for detection. The heater's characteristics are thereby recognized.

• Head temperature sensor

Temperature changes in the nozzle's heater are detected by the diode to prevent the bubble jet head from overheating.

• Cartridge ID

With the ID0, ID1 and INKS2 combinations, the BJ cartridge type (color or black or photo or Multi Drop) is recognized.

Table 2-1 Head Installation Status and Signal Detection

	ID0	ID1	INKS2
Black BJ cartridge installed	Low	Low	High
Color BJ cartridge (Multi Drop) installed	High	Low	Low
Photo BJ cartridge (Multi Drop) installed	High	High	Low
Color BJ cartridge installed	High	Low	High
Photo BJ cartridge installed	High	High	High

High: Signal detected
Low: No signal detection (by printer)

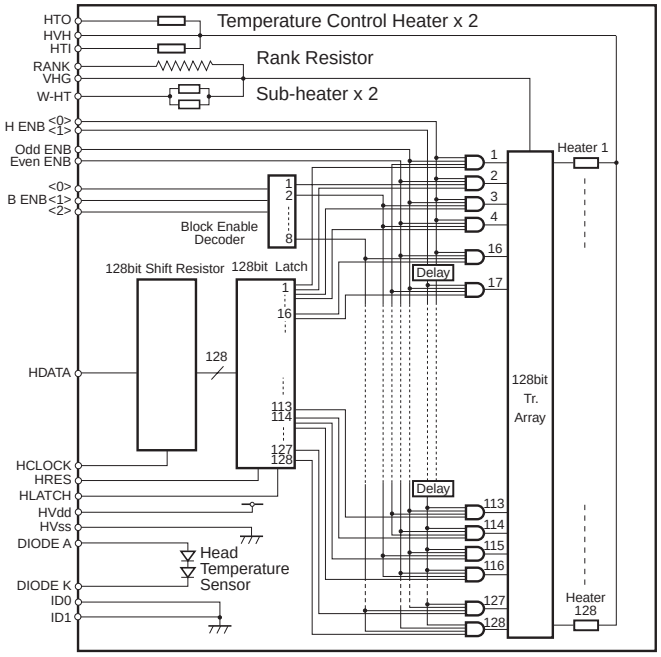
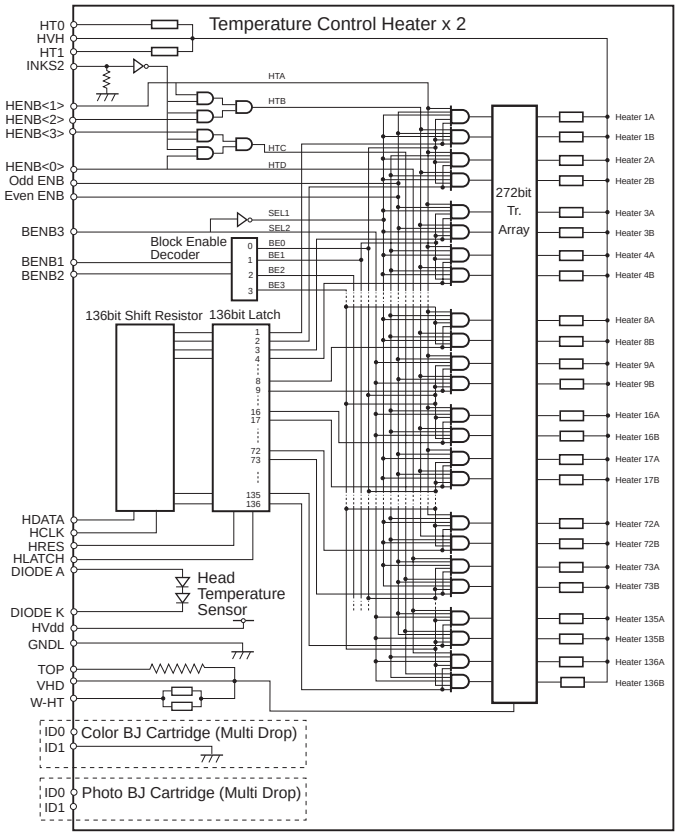


Figure 2-15 BJ Head Driver Block Diagram (Black BJ Cartridge)



Color BJ cartridge and Photo BJ cartridge have the same circuit configuration except for the ID1 connection.

Figure 2-16 BJ Head Driver Block Diagram (Color "Multi Drop" BJ Cartridge)

5.3 Printing Signal

a) Black BJ cartridge drive control

The black BJ cartridge driving control is executed by dividing the head's 128 nozzles into 8 blocks (16 nozzles each). These blocks are further divided into odd and even blocks (8 nozzles each). The odd blocks eject ink simultaneously, and the even blocks do so as well. The control signals for the former are the block enable 1, 2, and 3 signals (BENB 1, 2, 3), and for the latter the signals are the even/odd enable signals (Even/odd ENB).

The heat enable 0 and 1 (HENB 0, 1), which are the heater drive control signals for ejecting the ink, comprise the pre-pulse and main pulse. To constantly achieve optimum ink ejecting, the internal conditions such as the head's rank, printer temperature, head temperature are monitored, and the heater drive pulse width is varied before the pulse is output. Also, the printing drive signal from the printer controller is transferred to the BJ head's shift resistor according to the HLATCH timing.

The printing drive signal (HDATA) is latched and when the printing control signal and heater drive control signal are output together, the heater for the applicable nozzles is driven, and the ink is ejected.

b) Color BJ cartridge drive control

The color BJ cartridge head's nozzle configuration differs from that of the black BJ cartridge. (The black has 64 nozzles while the color has 24 nozzles each for Y, M, and C.) Therefore, the number of nozzles in each control block is different from that of the black BJ cartridge. Also, since the heaters are driven simultaneously for each color, the heater drive control signals used are the heat enable (HENB) 0, 1, 2, and 3 signals. Otherwise, everything else is the same as with the black BJ cartridge.

For heat enable, the HENB 0, 1, and 2 signals drive the nozzle heaters for Y, M, and C. The HENB 3 signal drives the nozzle heater for black ink.

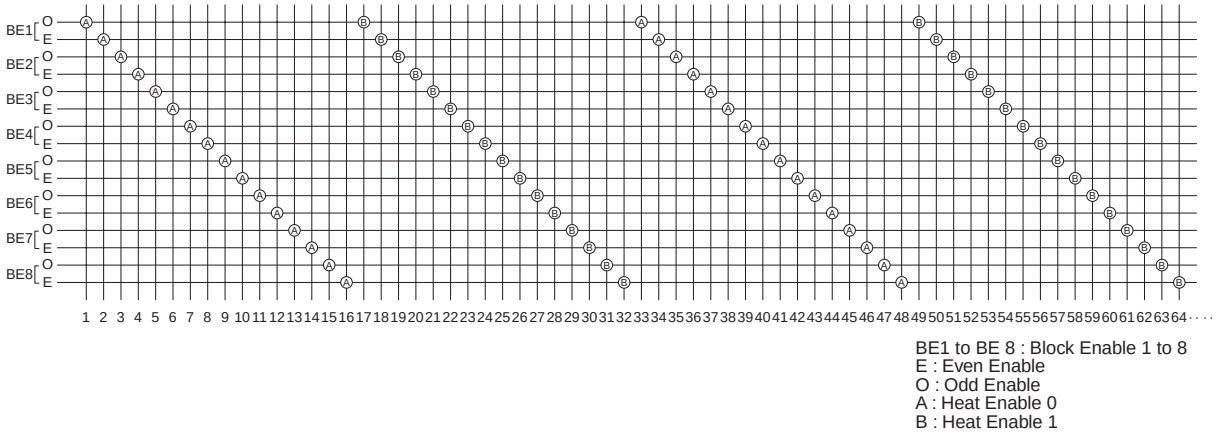


Figure 2-17 Printing Sequence (Black BJ Cartridge/HQ Mode)

c) Color BJ Cartridge (Multi Drop) Drive Control

The multi drop type color BJ cartridge's printhead has 136 nozzles and each nozzle has two heaters located one infront of the other. The printing operation using this multi drop type color BJ cartridge is (dependent/influenced) by how these heaters are controlled.

The sequence of ink ejection is as follows. The 136 nozzles has 8 function blocks (16 nozzles/block) and each block is separated into two functional units. Hence, each functional unit has 8 nozzles. Ink is consecutively ejected from each unit.

Selection of the nozzles to be ejected is done by BLOCK ENABLE signals 1, 2 and 3 (BENB 1, 2, 3) and the EVEN/ODD ENABLE signal (Even/Odd ENB). HEAT ENABLE (HENB 0, 1, 2, 3) is the heat drive control signal for ejecting ink.

The HEAT ENABLE signal controls ink ejection as follows:

HENB 0: signals the nozzle (black) at the back
HENB 1: signals the nozzle (black) at the front
HENB 2: signals the nozzle (color) at the front
HENB 3: signals the nozzle (color) at the back

The HEAT ENABLE signal is made of up the prepulse and the main pulse. To optimize ink ejection, the head rank, printer's inner temperature and head temperature is constantly monitored. The ink is ejected by varying the HEAT ENABLE pulse width.

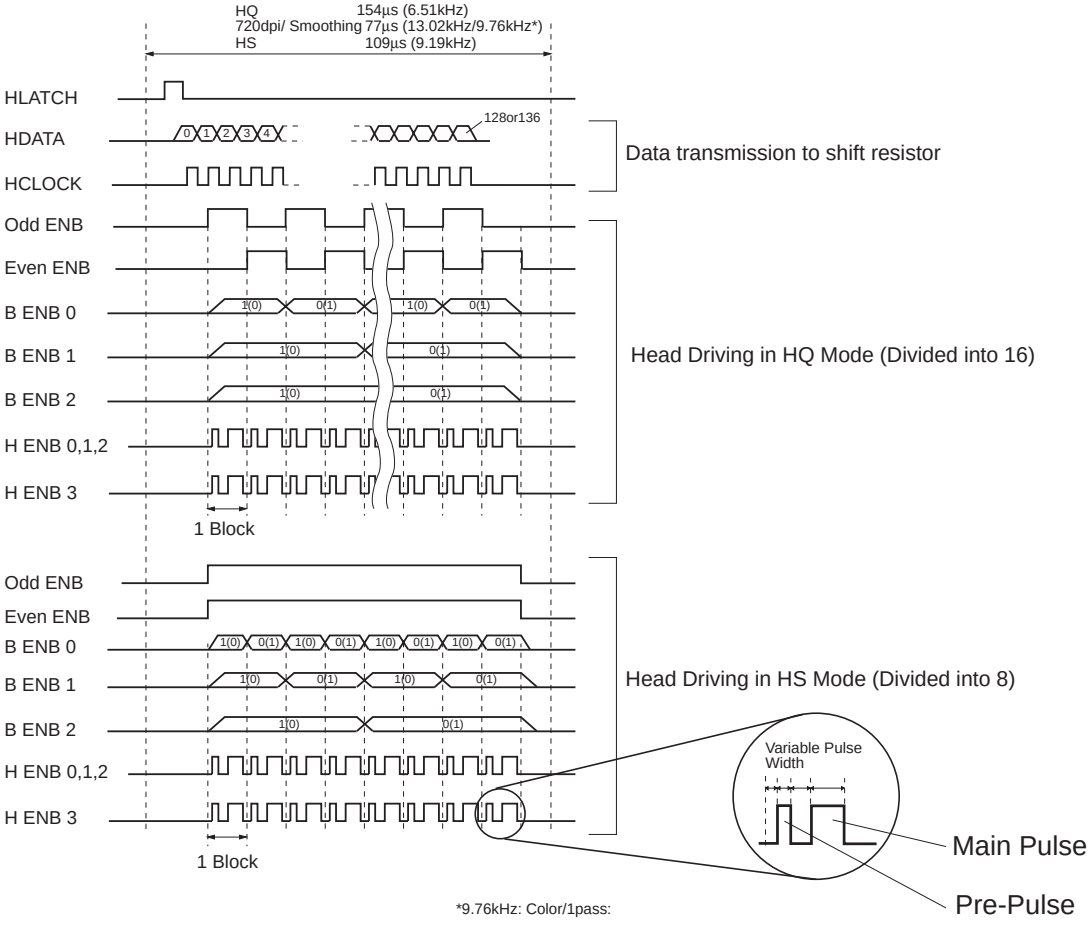


Figure 2-18 Printing Signals

6. ELECTRIC CIRCUIT

6.1 Component Block Diagram

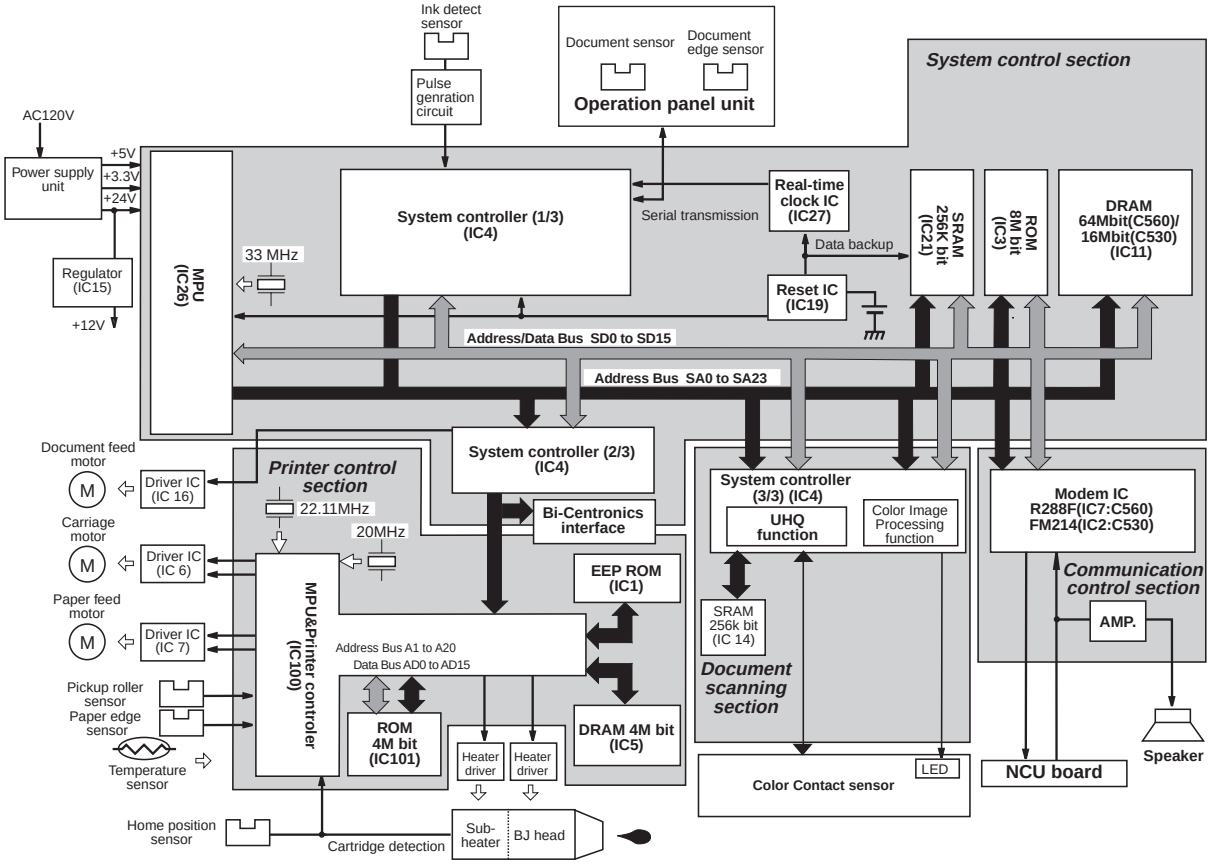


Figure 2-19 Block Diagram

6.2 Circuit Board Components

a) System control section

The system controller is made up of the following components, and controls the entire fax system. This section drive +3.3V voltage from power supply unit.

a-1) MPU (Micro Processor Unit) (IC 26)

The main functions of the NEC μPD703102GJ-A33-022-8EU(V850) MPU are as follows.

- 32 bit CPU
- 24 bit address bus
- 16 bit data bus
- DMA control
- A/D converter
- Serial interface
- Software CODEC (MH, MR, MMR, JBIG)
- Color FAX function (Lab color conversion, JPEG encode/decode)
- Interrupt control unit
- Built-in 4K Byte RAM for working area
- Built-in 128K Byte Mask-ROM for programable area

a-2) System controller (IC 4)

The system controller is a gate array for controlling MPU peripheral devices. This IC drive +5V and +3.3V voltage. The main functions of the system controller are as follows:

- Printer resolution conversion (Ultra-smoothing)
  This IC converts facsimile data of horizontal resolution of 8 dots/mm and vertical resolution of 3.85 or 7.7 lines/mm to print data of 360 dpi and 360 dpi, respectively.
- BJ printer interface (IEEE 1284)
  8 bit parallel print data sent to the Printer controller.
- OPCNT serial interface (Contains document sensor and document edge sensor signals)
- DRAM/SRAM controller
  Controls DRAM/SRAM read/write and renewal.
- Serial-to-parallel conversion
- Horizontal scaling
- Detection of document edge sensor and ink detection sensor

a-3) RTC (Real Time Clock) IC (IC 27)

S-3510ANFJA is used as the RTC. The RTC IC is backed up by lithium battery, and counts the date and time.

a-4) Main ROM (IC3)

This 8 Mbit ROM contains the control programs (e.g. operation panel, scanner and communications section etc.) for this fax.

a-5) SRAM (IC 21)

This 256 Kbit SRAM is backed up by lithium battery. SRAM holds data registered for system control and communications management information. Also, SRAM stores contact sensor LED light-on time data.

a-6) DRAM (IC 11)

This 64Mbit **(MultiPASS C560)**/16Mbit **(MultiPASS C530)** DRAM is used as memory for storing image data, and as an MPU work area.

b) Communication control section (on Modem board)

b-1) Modem IC

MultiPASS C560 (IC 7)

A Conexant R288F (PLCC type) is used as the modem IC. The MODEM IC carries out G3 modulation conforming to ITU-T standards V.34, V.29, V.27ter, V.21, V.17 and V.8 on transmitted data received from the MPU during transmission. During reception, the MODEM IC carries out G3 modulation on received signals from the telephone line, according to the same standards.

MultiPASS C530 (IC 2)

A Conexant FM214 (QFP type) is used as the modem IC. The MODEM IC carries out G3 modulation conforming to ITU-T standards V.29, V.27ter, V.21 and V.17 on transmitted data received from the MPU during transmission. During reception, the MODEM IC carries out G3 modulation on received signals from the telephone line, according to the same standards.

c) Document scanning section

c-1) System controller IC (IC 4)

The system controller IC include image processing function (UHQ) are as follows:

- A/D conversion
  Input signals from the contact sensor are A/D converted.
- Generation of shading data (RGB color & Black and white)
- ABC (Auto Background Control)
  Sets the slice level for each scan line.
- Edge enhancement processing
- Binaryzation processing
- Halftone processing
- Contact sensor LED control
- Document feed motor control

Also, the system controller IC include color image processing function are as follows:

- Color image processing
  The RGB data is converted into CMYK print data.

d) Printer control section

This section's ICs are drive

d-1) MPU&Printer controller (IC 100)

The main functions of the printer controller are as follows:

- Bi-centronics interface
- EEP-ROM control
- DRAM control
- Buffer control
- Print head control

Also, the printer controller include MPU function are as follows:

- 16 bit CPU
- 21 bit address bus
- 16 bit data bus
- Carriage motor/Paper feed motor control

The stepping motor controller outputs the carriage motor's single- and two-phase exciter drive signal, and paper feed motor's two-phase drive signal.

The stepping motor controller switches the carriage motor with the 5-step peak current value for optimum driving. The stepping motor controller outputs the switching control signal to the carriage motor driver.

- Detection of BJ head temperature
- Detection of printer's internal temperature.
- Detection of Home position sensor, Paper edge sensor and Pickup roller sensor.
- Cartridge detection.

d-2) ROM (IC 101)

The 4 Mbit control/CG ROM contains the program and bitmap font data for printer control.

d-3) DRAM (IC 5)

4 Mbit DRAM is used as the print buffer, and working area.

d-4) EEPROM (IC 1)

Controlled by the printer controller, the 1 Kbit EEPROM (Electrically Erasable and Programmable ROM) stores various printer emulation settings, and the waste ink amount discharged to the waste ink absorber.

6.3 Flow of Image Signals

a) G3 transmission

(1) With the LED as a light source, the image is scanned by the contact sensor, and analogue image data sent to the SPCNT board.
(2) The System controller IC (Internal UHQ unit) converts analogue image data from the contact sensor to digital image data.
(3) The system controller IC converts processed image data from serial data to parallel data, and writes them to the DRAM.
(4) The raw data in DRAM is written into DRAM as encoded image data.
(5) The MODEM IC modulates the coded image data.
(6) The modulated data are then sent from the MODEM IC to the NCU board.

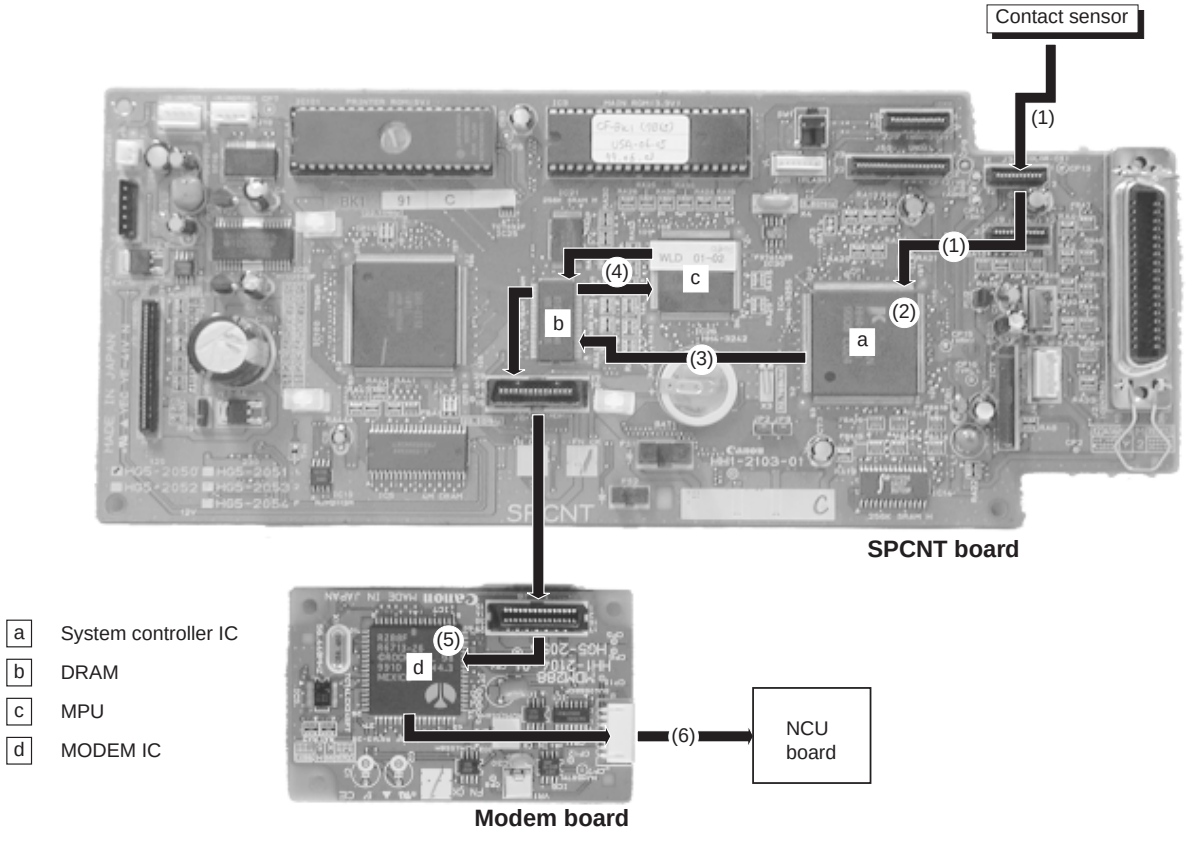


Figure 2-20 G3 Transmission Image Signal Flow

b) G3 Reception

(1) Image signals received by L1, L2, pass through the hybrid circuit in the NCU, and are amplified. The modem demodulate these images, and writes them to the DRAM.

(2) The demodulated image data is generally recorded in DRAM, and after re-encoding is written to DRAM as coded data.

(3) The system controller IC converts the decoded data from run-length data to raw data, and converts 8 dot/mm fax data into 360 dpi resolution converted printer data, and writes them to the DRAM.

(4) The system controller IC converts the resolution converted printer data to BJ printer head control signals, and then sends the signals to the BJ print head, via the MPU & printer controller IC. Simultaneously, the MPU & printer controler IC sends motor control signals to the carriage motor and line feed motor, via the driver IC.

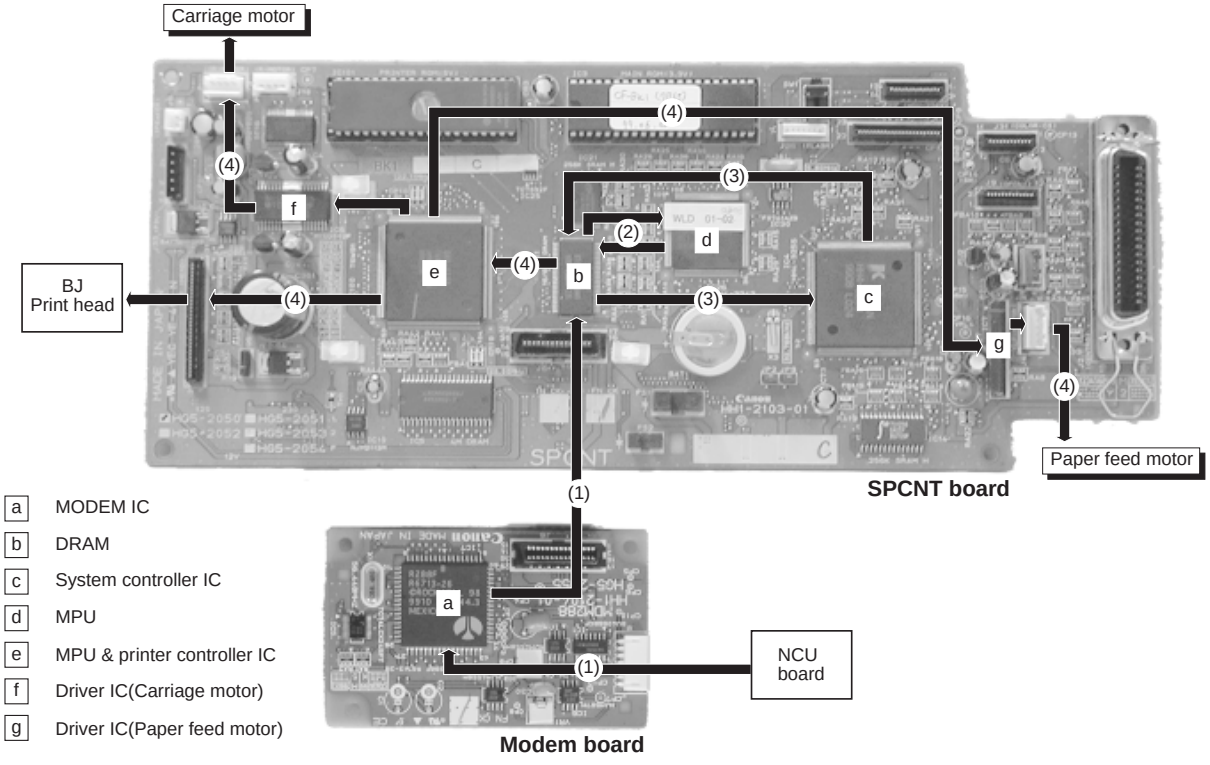


Figure 2-21 G3 Reception Image Signal Flow

c) Color G3 transmission

(1) With the LED as a light source, the image is scanned by the contact sensor, and RGB analogue image data sent to the SPCNT board.
(2) The System controller IC (Internal UHQ unit) converts analogue image data from the contact sensor to RGB digital image data.
(3) The system controller IC converts the RGB image data from serial data to parallel data, and writes them to the DRAM.
(4) The RGB data is converted to Lab data, JPEG-compressed, and written to DRAM.
(5) The MODEM IC modulates the coded image data.
(6) The modulated data are then sent from the MODEM IC to the NCU board.

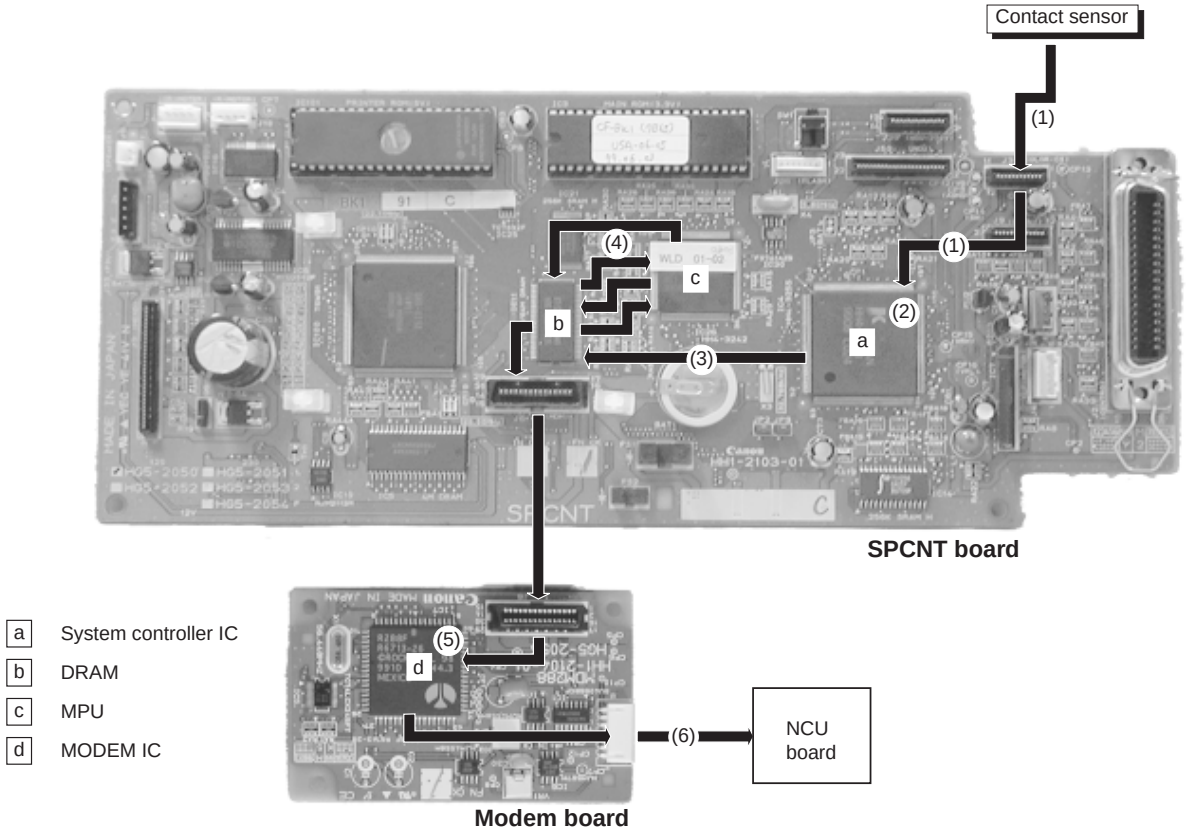


Figure 2-22 Color G3 Transmission Image Signal Flow

d) Color G3 Reception

(1) Image signals received by L1, L2, pass through the hybrid circuit in the NCU, and are amplified. The modem demodulate these images, and writes them to the DRAM.

(2) The JPEG data is converted to Lab data and then converted to RGB data.

(3) The 200 dpi RGB data is converted to 360 dpi CMYK print data.

(4) The system controller IC converts the resolution converted printer data to BJ printer head control signals, and then sends the signals to the BJ print head, via the MPU & printer controller IC. Simultaneously, the MPU & printer controler IC sends motor control signals to the carriage motor and line feed motor, via the driver IC.

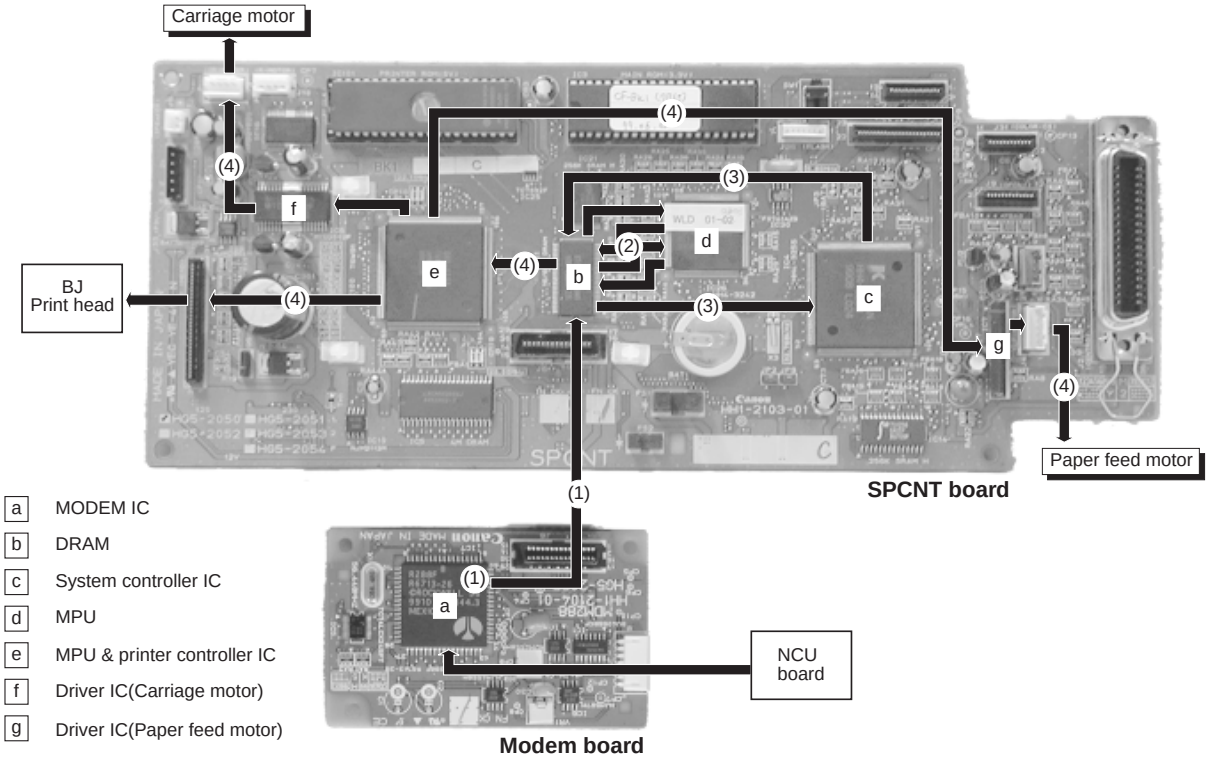


Figure 2-23 Color G3 Reception Image Signal Flow

e) Color image scan

(1) Using the LED as a light source, the image is scanned by the contact sensor, and RGB analogue image data is sent to the SPCNT board.
(2) The System controller IC (Internal UHQ unit) converts analogue image data from the contact sensor to RGB digital image data.
(3) The system controller IC converts the RGB digital image data from serial data to parallel data, and writes them to the DRAM.
(4) The RGB data is encoded and written to DRAM.
(5) The system controller IC sends the data written into DRAM to the PC using the bi-centronics interface.

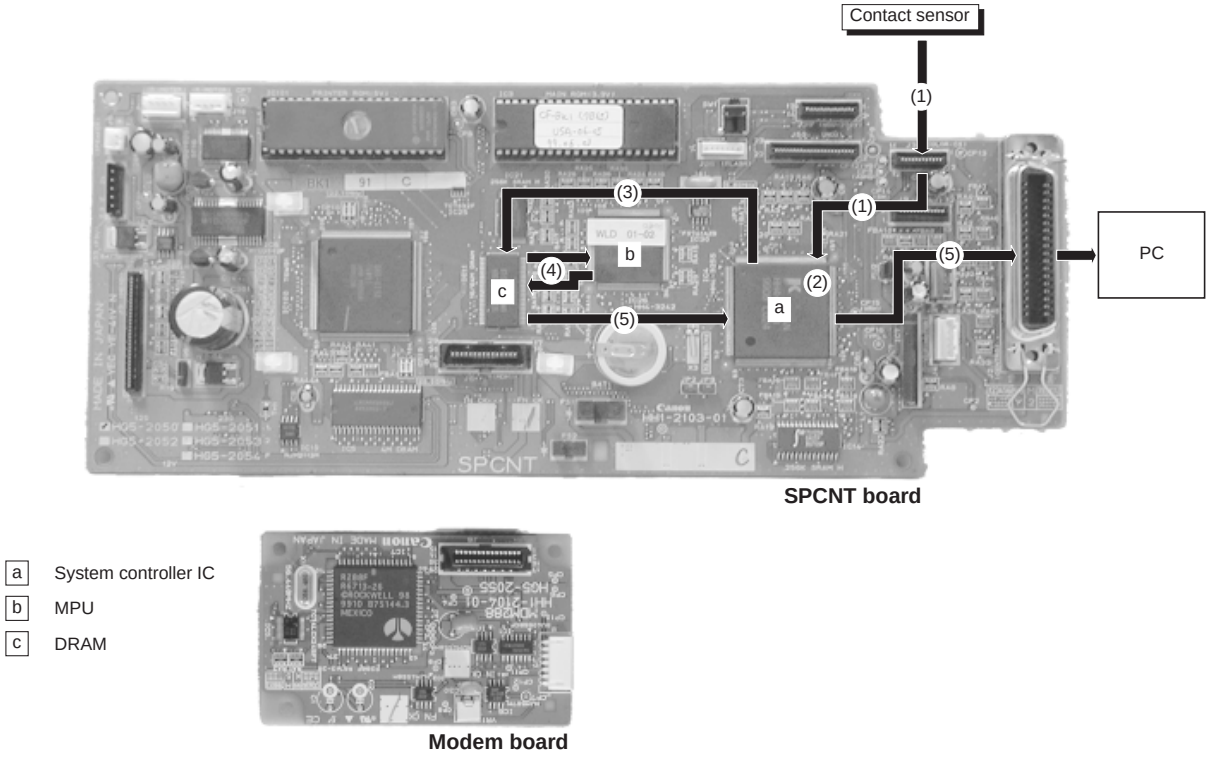


Figure 2-24 Color Image Scan Signal Flow

7. COMMUNICATION SYSTEM OPERATIONS

7.1 FAX/TEL Switching

This fax is set to automatically switch between fax and telephone, on the same telephone line. If the other party is a fax, the fax is received automatically, and if the other party is a telephone, the alarm in the main unit is rung to alert the user.

7.1.1 Settings

(1) Press the **Receive Mode** button to select the Fax/Tel mode.
(2) Set the **"FAX/TEL AUTO SW"** in **RX SETTINGS** menu**.**

7.1.2 Parameters

Item	Default setting	Setting switch	Selection range
RING START TIME (Pseudo Ring start time)	8 sec.	User data	0 to 30 sec.
F/T RING TIME (Pseudo Ring time)	15 sec.	User data	10 to 45 sec.
DEFAULT ACTION (Operation after FAX/TEL switching)	RECEIVE	User data	RECEIVE/ DISCONNECT
Pseudo RBT frequency	400 Hz	None	None (fixed)
Pseudo RBT transmission from CML on time until start (CNG detection time)	4 sec.	Service data #3 16	0 to 9 sec.
Pseudo RBT pattern on time	1000 ms	Service data #3 17	0 to 9990 ms
Pseudo RBT pattern off time (short)	0 ms	Service data #3 18	0 to 9990 ms
Pseudo RBT pattern off time (long)	2000 ms	Service data #3 19	0 to 9990 ms
Pseudo RBT transmission level	-23 dBm	Service data #3 24	-23 to -8 dBm
Pseudo ring frequency	25Hz	Service data #2 10	17Hz/25Hz/50Hz
Pseudo ring pattern on time	1000 ms	Service data #3 20	0 to 9990 ms
Pseudo ring pattern off time (short)	0 ms	Service data #3 21	0 to 9990 ms
Pseudo ring pattern off time (long)	2000 ms	Service data #3 22	0 to 9990 ms
CNG detection level	-47 dBm	Service data #3 23	-50 to -29 dBm (MutiPASS C530 only)

7.2 Answering Machine Connection

This connection is for effective use of an answering machine connected to the extension phone jack. If the other party is a telephone, the answering telephone records the message, and if the other party is a fax, the fax receives automatically.

7.2.1 Settings

(1) Connect the answering machine to the extension telephone jack, and set the answering machine to **"Answer"**.

(2) Press the fax's **Receive Mode** button and select the Ans. Machine mode.

7.2.2 Parameters

Item	Default Setting	Setting Switch	Selection Range
CNG Signal detection time	60 sec.	Service data #3 25	0 to 999 sec.

7.3 Manual/Auto Reception Switching

Determines if the fax switches to document receive mode, after the fax rings for a specified time when the fax is in the manual receive mode.

7.3.1 Settings

(1) Set the **"MAN/AUTO SWITCH"** in the user data **"RX SETTINGS"** to **"ON"**.

(2) Set the number of seconds that the fax will wait after detecting ringing signal from the telephone line before going into reception, using user data **"F/T RING TIME"** in **"MAN/AUTO SWITCH"**.

7.3.2 Parameters

Item	Default Setting	Setting Switch	Selection Range
MAN/AUTO SWITCH	OFF	User data	ON/OFF
F/T RING TIME	15 sec.	User data	1 to 99 sec.

8. NEW FUNCTION

8.1 High-speed Transmission

The image transmission time is reduced drastically compared with the previous models by the V.34 modem (maximum transmission speed 33600 bps) recommended by ITU-T.

8.1.1 V.8/V.34 protocol

a) Outline

- The V.8 protocol is used as the startup protocol to move to V.34. The V.8 protocol enables connection with fax machines, data modem and equipment using existing V-series modems. The V.34 modem contains a modem circuit based on the previous recommendation to connect with the previous modems and has upper compatibility.

- The actual data transmission speed is improved entirely on average by speeding the modulation method and utilizing new techniques, such as the pre-emphasis technique[*1] for increasing the S/N (signal-to-noise) ratio and the probing technique[*2] for measuring line characteristics and optimizing the modem operation according to the line condition.

- The V.8 protocol, V.34 pre-protocol and post-protocol use full-duplex transmission to speed the processing.

- Fourteen image transmission speeds[*3] are available:
  33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, and 2400 bps

- The modulation speed (baud rate)[*4] can be selected from among 2400, 3000, and 3200 symbols/sec (required) or 2743, 2800, and 3429 symbols/sec (option). The data transmission speed can be set more finely than the previous modems.

NOTE

*1 The output level of a high-frequency zone with comparatively high noise is raised, and then the transmission signal is sent.

*2 A tone signal known as a probing signal (L1 and L2) is output, and the receiving side measures the characteristics of the line.

*3 The data signaling rate is recorded in the ITU-T standards manual. Image transmission speed means the same as data signaling rate.

*4 The symbol rate is recorded in the ITU-T standards manual. Symbol rate means the same as moderation speed and baud rate.
2743 symbol/sec cannot be used with this fax.

NOTE

1. The V.34 protocol uses ECM. If the ECM SW in user data is set to OFF, the V.8 protocol is not executed. Therefore, the V.34 protocol is not used, and V.17 or a lower protocol is selected.
2. If the transmission speed is set to 14400 bps or lower, the V.8 protocol is not executed and V.17 or a lower protocol is selected.
3. After the V.21 protocol is selected first, it can be changed to V.8 or V.34. (See c-1))
4. When the V.34 protocol begins, it falls back within the V.34 protocol, but it does not fall back to the V.17 mode or lower.

b) Typical protocol

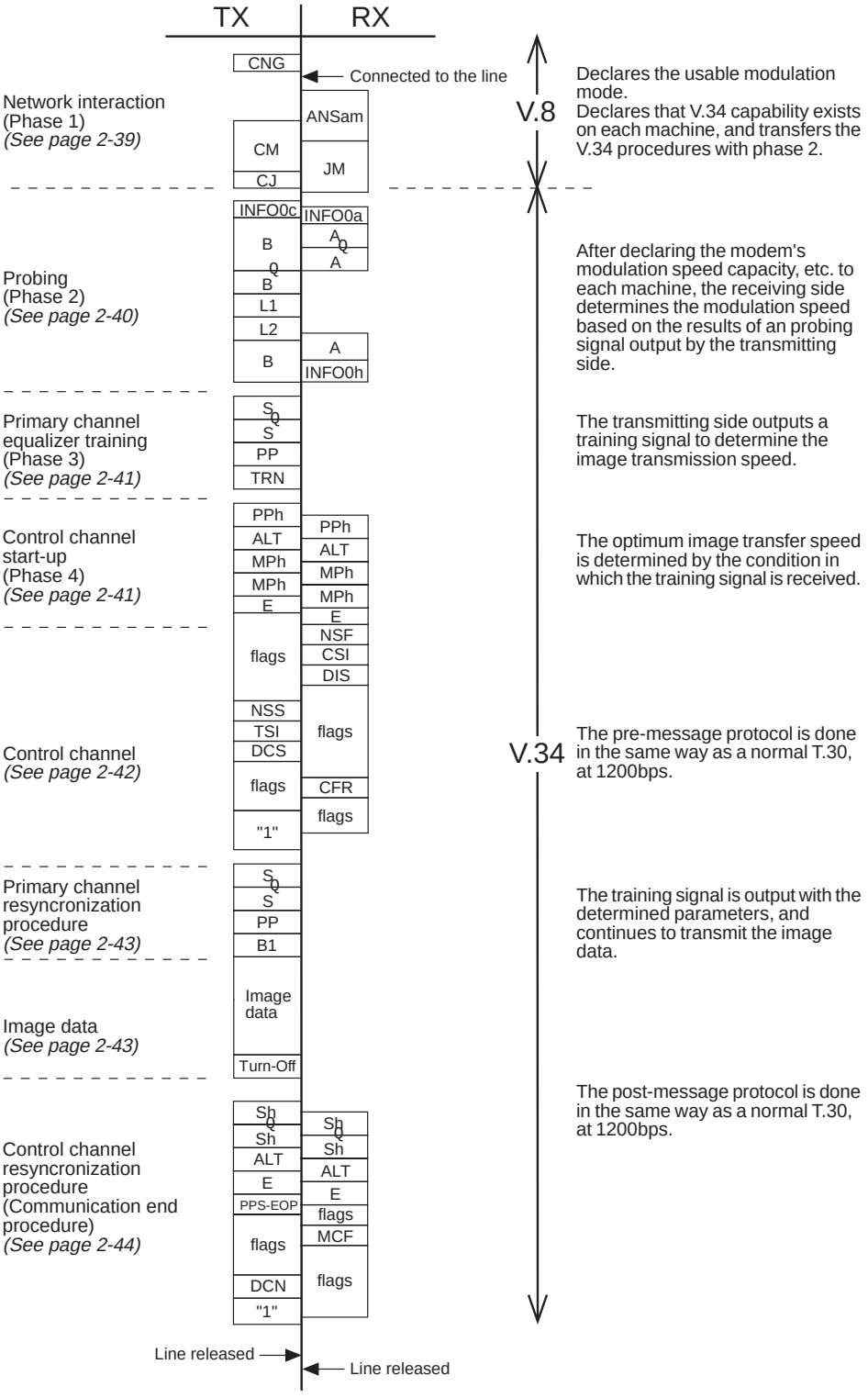


Figure 2-25 Typical Protocol

b-1) Network interaction (Phase 1)

The V.8 protocol is used as the startup protocol for high-speed modem V.34.
The V.8 protocol determines the best modulation method (V-series modem mode) that is available between the transmitter and receiver.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
Calling tone	CNG	1100-Hz tone signal specified by T.30 to identify an automatic-calling fax machine.	
Dial-tone menu signal	CM	Indicate an available modulation method (V.21, V.27ter, V.29, V.17, or V.34).	Modulated by V.21(L)*1.
CM terminator	CJ	Indicate JM signal detection and CM signal termination.	Modulated by V.21(L)*1.
Dial-tone display signal	CI	Indicate the general transmission function. Sent to resume the V.8 protocol.	Late start only. (See Figure 3-xx.) Modulated by V.21(L)*1.

• Receiver

Signal	Abbre-viation	Meaning	Remarks
Modified response tone	ANSam	2100-Hz tone signal amplitude-modulated by 15 Hz.	Equivalent to CED for previous models.
Common menu signal	JM	Indicate the terminal type, such as a fax machine, and an available modulation method in response to the available modulation method reported by the CM from the transmitter.	Modulated by V.21(H)*1.

*1 V.21(L): Low-frequency channel defined by V.21 recommendation
1080±100 Hz (980 Hz:1, 1180 Hz:0)
Transmission speed: 300bps
V.21(H): High-frequency channel defined by V.21 recommendation
1750±100 Hz (1650 Hz:1, 1850 Hz:0)
Transmission speed: 300bps

b-2) Probing (Phase 2)

The line characteristics are measured and modulation-related parameters, such as symbol rate, are set.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
INFO sequence	INFO0c	Indicate modem capabilities, such as baud rate and frequency transmission function (two frequency bands used to measure line characteristics), and request adjustment.	Transmission speed: 600bps
Tone B	B	Modem synchronization with a 1200-Hz tone signal.	The phase of the B-signal is inverted 180 degrees from the phase of the B signal.
Tone $\overline{B}$	$\overline{B}$		
Probing signal L1	L1	Tone signal for analyzing line characteristics by probing.	Probing: Measurement of line characteristics. Tone signal in the range 150 to 3750 Hz in 150-Hz steps.
Probing signal L2	L2		

• Receiver

Signal	Abbre-viation	Meaning	Remarks
INFO sequence	INFO0a	Report the modem capabilities, such as baud rate and frequency transmission ability.	Transmission speed: 600bps
Tone A	A	Modem synchronization with a 2400-Hz tone signal.	The phase of the A-signal is inverted 180 degrees from the phase of the A signal.
Tone $\overline{A}$	$\overline{A}$		
INFO sequence	INFO0h	Report the pre-emphasis filter and baud rate used for data transmission based on the result of analysis of the probing signal.	Transmission speed: 600bps

b-3) Primary channel equalizer training (Phase 3)

Filters, such as equalizers, are trained (adjusted) with the parameters set in phase 2.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
S signal	S	Short training	The phase of $\overline{S}$ is shifted from the phase of S.
$\overline{S}$ signal	$\overline{S}$		
PP signal	PP	The other modem uses this signal to train the equalizer.	
TRN signal	TRN	The receiver uses this signal to determine the transmission speed.	

b-4) Control channel start-up (Phase 4)

Select the maximum data signalling rate and trellis encoder and set the data signalling rate that can be supported.

• Transmitter/receiver

Signal	Abbre-viation	Meaning	Remarks
PPh signal	PPh	The other modem uses this signal to train the equalizer.	
ALT signal	ALT	———	
Modulation parameter	MPh	Indicate the image transmission parameters, such as maximum data signal speed, control channel data signal speed, trellis coding type, pre-coding type, and baud rate.	
E sequence	E	———	20-bit sequence of binary 1's.

b-5) Control channel

The conventional T.30 protocol is executed.
The transmission speed is 600bps.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
Flag	flags	Maintain synchronization.	7E (H)
Non-standard facilities set-up	NSS	Receive NSF from the other party, select an available mode from it, and instruct reception.	
Transmitting subscriber identification	TSI	Report the transmitter telephone number.	
Digital command signal	DCS	Instruct the available mode.	
———	1	Declare to switch to high-speed protocol.	Transmit 1's.

• Receiver

Signal	Abbre-viation	Meaning	Remarks
Non-standard facilities	NSF	Report functions not recommended by ITU-T, user's ID, manufacturer code, etc.	
Called subscriber identification	CSI	Report the receiver telephone number.	
Digital identification signal	DIS	Report standard ITU-T-recommended functions.	
Flag	flags	Maintain synchronization.	7E (H)
Confirmation to receive	CFR	Report that modem training ends and image signal reception is ready.	

NOTE

In the control channel, signals which differ according to the frequencies of both TX and RX are output. It follows that the effects of the echo are not received because the frequencies of the signal returned by echo and the signal output by the other machine are different.

b-6) Primary channel resyncronization procedure

Training is performed with the parameters set in phase 4.
The transmission speed is 1200bps.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
S signal	S	Short training	The phase of $\overline{S}$ is shifted from the phaseof S.
$\overline{S}$ signal	$\overline{S}$		
PP signal	PP	The other modem uses this signal to train the equalizer.	
Sequence B1	B1	Scramble data frame transmitted at the end of start-up protocol.	

b-7) Image data

Transmit image data.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
Image data	Image data	Encoded image data	
———	Turn-off	———	Send scrambled 1's for 35 ms.

b-8) Control channel resyncronization procedure (Communication end procedure)

Protocol for terminating transmission.
The transmission speed is 1200bps.

• Transmitter

Signal	Abbre-viation	Meaning	Remarks
Sh signal	Sh	Short training	
$\overline{\text{Sh}}$ signal	$\overline{\text{Sh}}$		
ALT signal	ALT	———	
E sequence	E	———	
End of procedures	PPS-EOP	One page is transmitted.	
Flag	flags	Maintain synchronization.	7E (H)
Disconnect signal	DCN	Disconnect the line.	

• Receiver

Signal	Abbre-viation	Meaning	Remarks
$\overline{\text{Sh}}$ signal	$\overline{\text{Sh}}$	Short training	
Sh signal	Sh		
ALT signal	ALT	———	
E sequence	E	———	
Flag	flags	Maintain synchronization.	7E (H)
Message confirmation	MCF	Indicate that the receiver has received the image signal correctly and can receive the next document immediately.	

c) Examples of sequences

The signals in the shaded areas are important in the protocol.

c-1) Late start

Since the receiver cannot detect the CM signal while sending the ANSam signal, it sends the DIS signal containing the "V.8 protocol" declaration. The transmitter sends the CI signal to request the receiver to send the ANSam signal again to move to V.8 protocol.

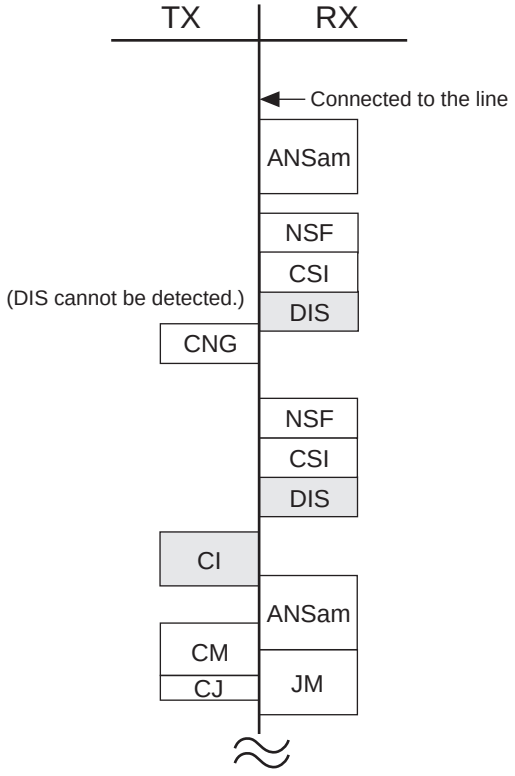


Figure 2-26 Late Start

c-2) Between-page sequence

The transmitter sends image data, then the PPS-MPS signal in the same as for the T.30 protocol. The receiver sends the MCF signal to receive the next page.

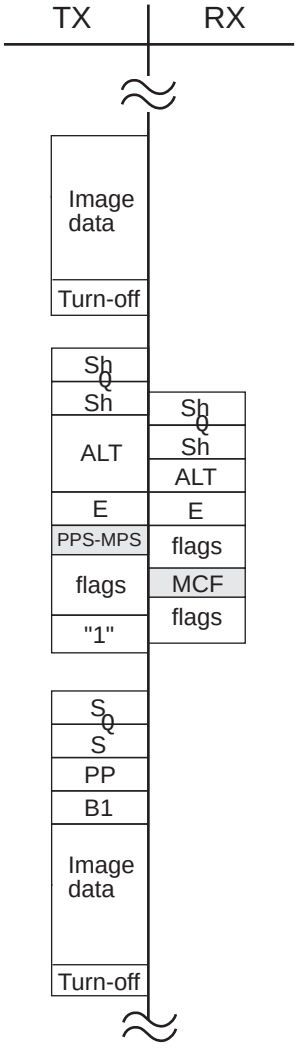


Figure 2-27 Between-page Sequence

c-3) Mode change

The transmitter sends PPS-EOM and the receiver sends the MCF signal. Then the receiver sends the DIS signal and the transmitter sends the DCS signal to change the mode.

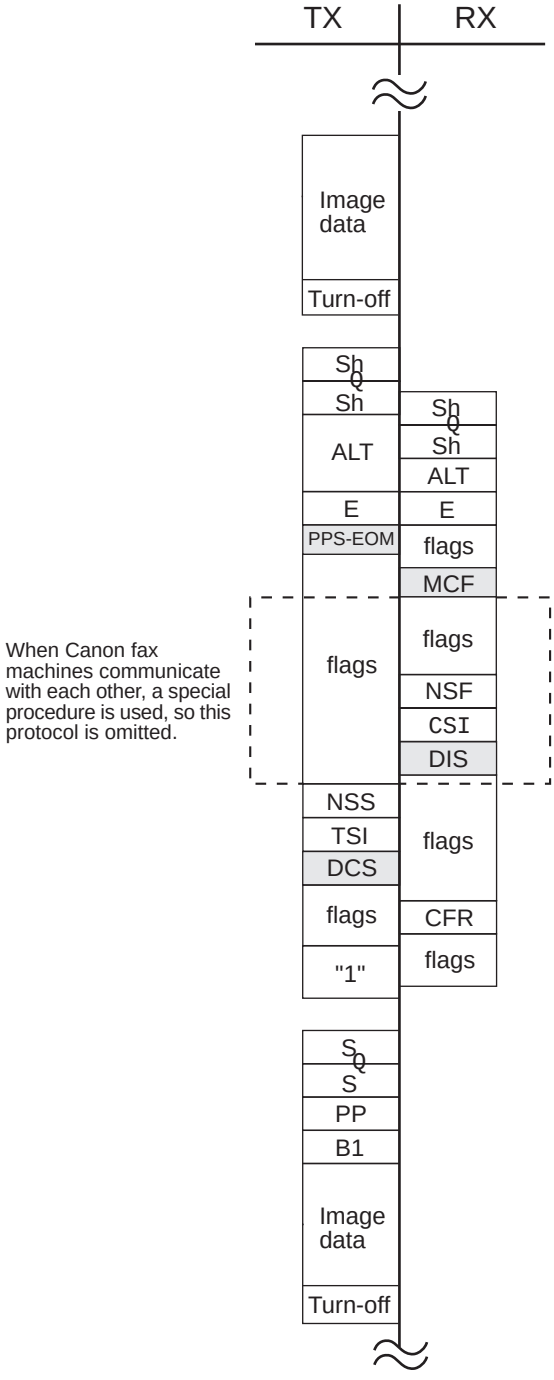


Figure 2-28 Mode Change

c-4) Image transmission speed change from the receiver

The receiver returns to the PPh signal in response to the Sh signal from the transmitter. The image transmission speed is then determined by the MPh sequence sent from both modems.

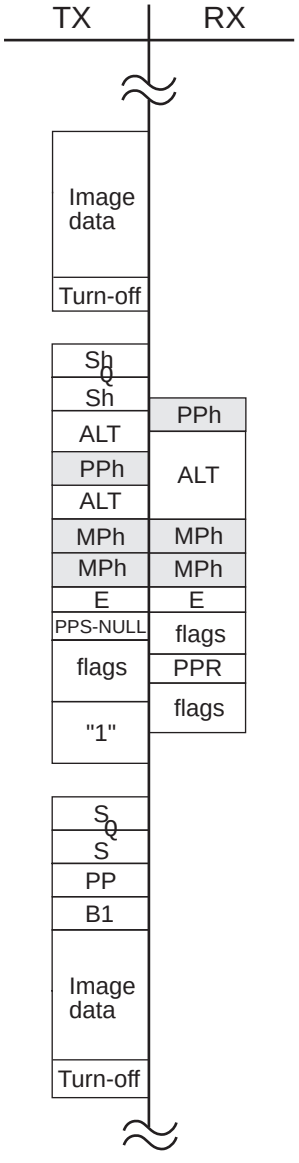


Figure 2-29 Image Transmission Speed Change from the Receiver

c-5) Image transmission speed change from the transmitter

The transmitter sends image data, and then the PPh signal, and the receiver returns the PPh signal to the transmitter. The image transmission speed is then determined by the MPh sequence sent from both modems.

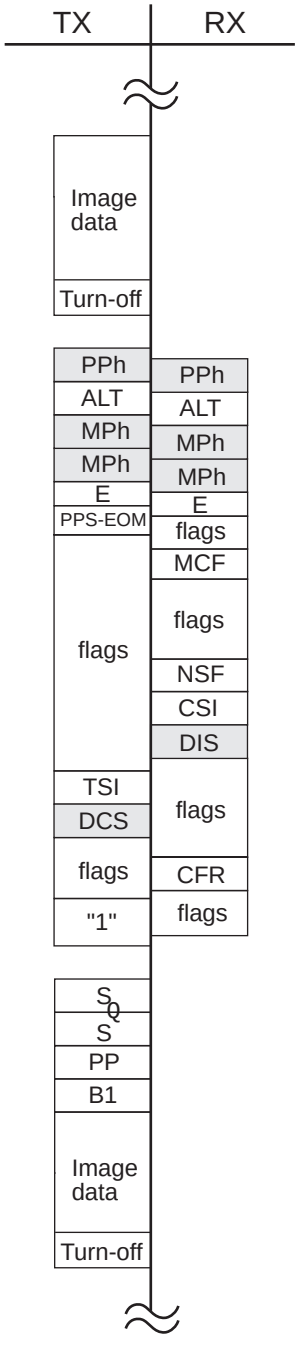


Figure 2-30 Image Transmission Speed Change from the Transmitter

8.2 JBIG Image Compression Encoding Method

8.2.1 Outline of the JBIG image compression encoding method

The JBIG Image Compression Encoding Method is recommended in ITU-T T.82/T.85 as a new bi-level (bi-level: White and Black) image compression encoding method developed by JBIG (Joint Bi-level Image experts Group).

The JBIG Image Compression Encoding Method has the following characteristics with regards to text documents, quasi-gray scale images with little continuous black and white, and gray scale images which use a dithering method: a higher compression rate (1.1 ~ 30 times higher) than the conventional MMR compression method, the encoded volume will not exceed the volume of original image information after compression, and when decoding, the image can be completely re-assembled to its original condition in the same way as with conventional MR/MMR.

The JBIG Image Compression Encoding Method contains Progressive Bi-level Image Compression for searching image databases, recommended in ITU-T T.82, and Single Progression Sequential Bi-level Image Compression for facsimile, recommended in ITU-T T.82 and T.85.
Images will take on the form shown below.

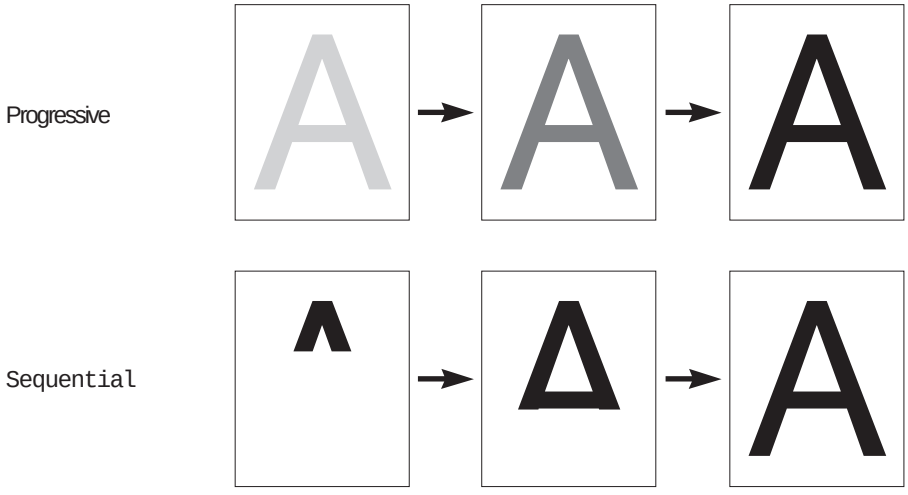


Figure 2-31 Images

NOTE

The characteristics of Progressive Bi-level Image Compression are explained below as a reference. First of all, after the original image has been read in at high resolution, it is converted to low resolution, and this low resolution image data proceeds to be encoded (compressed). On the receiving end, the overall original image can be quickly recognized by the steps in which this low resolution image compression data is received.
Next, to improve the quality of the low resolution image already sent, only information needed to improve the resolution is forwarded. The previous low resolution image is decoded on the receiving side with this information, and following this, the high resolution image is displayed on top of the previous low resolution image.
It is easy to quickly recognize the original image in the process of displaying the image from low resolution to high resolution in order by using this method, with a CRT display for example. Also, according to the situation, it is possible to interrupt the image transfer at the point where the original image is recognized to some degree by the receiving side.
This method requires a page buffer memory for the low resolution image because the low resolution images are used for the purpose of high resolution image encoding.

8.2.2 Single progression sequential bi-level image compression method

The Single Progression Sequential Bi-level Image Compression Method used in this fax is explained below.
The Progressive Bi-level Image Compression Method uses multiple resolution layers on a single page (multi-level layers, low resolution layers~high resolution layers) to perform encoding/decoding. In the Single Progression Sequential Bi-level Image Compression Method, encoding is done in units of horizontal bands (a number of lines) called stripes, and is performed from left to right, top to bottom (this condition is called sequential), and in one resolution layer (single layer).

NOTE

In this method, the encoding is done in stripe units, so it is completed with a buffer memory much smaller than a page buffer memory.

The methods by which encoding takes place and by which image data is constructed after encoding are explained below.

8.2.3 Encoding method

In the JBIG encoding used in the Single Progression Sequential Bi-level Image Compression Method, uses in the encoder shown below to encode to the original the results of comparison of the line currently being processed and the previous line, as well as the predicted value of an image pixel (white or black) used in a model template.

The study table used in the prediction makes the next prediction more accurate by learning and correcting the study table every time the model template moves to the adjoining pixel. It is characteristic of this method that if the prediction is accurate the amount of encoding will not increase, and if the prediction is off the amount of encoding increases, so the increase in prediction accuracy of this study table is very important.

An outline of the encoding procedure is shown below.

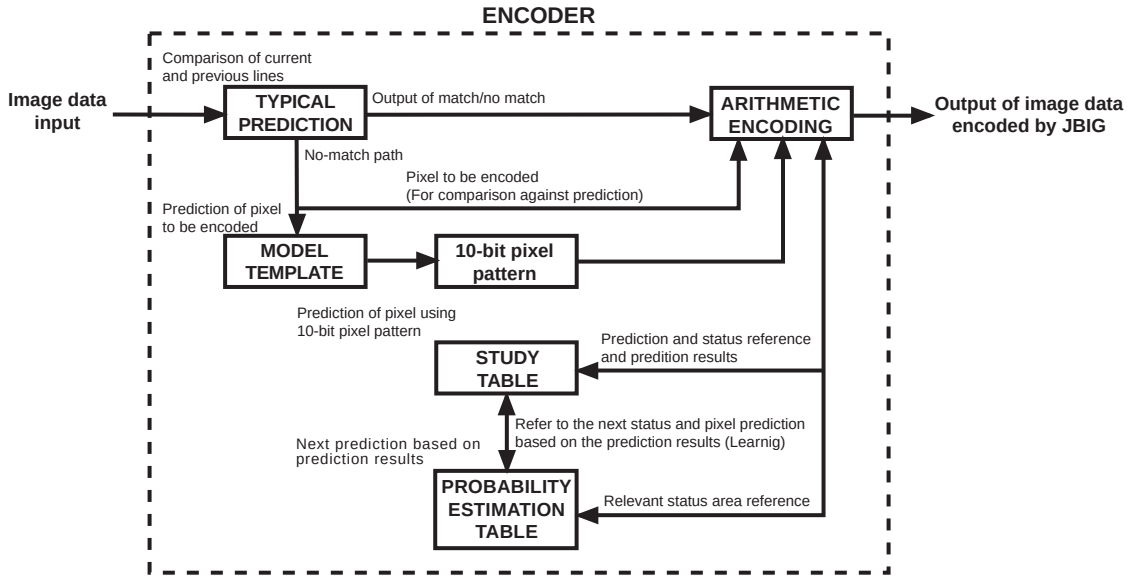

ENCODER
Comparison of current and previous lines
Image data input
TYPICAL PREDICTION
Output of match/no match
ARITHMETIC ENCODING
Output of image data encoded by JBIG
No-match path
Pixel to be encoded (For comparison against prediction)
Prediction of pixel to be encoded
MODEL TEMPLATE
10-bit pixel pattern
Prediction of pixel using 10-bit pixel pattern
Prediction and status reference and predition results
STUDY TABLE
Refer to the next status and pixel prediction based on the prediction results (Learnig)
Next prediction based on prediction results
PROBABILITY ESTIMATION TABLE
Relevant status area reference

Figure 2-32 Encoder and Flow of JBIG Encoding

a) In the pattern prediction section, the line currently being processed and the current line are compared, and judged to match or not match. A flag showing whether or not the lines match (1 bit, 0: match, 1: don't match) is attached to the head of each line according to this judgment. When the lines match, only this flag is encoded in the arithmetic encoding section as a suspected pixel, the pixel of the line being currently processed is not encoded. When the lines do not match, the pixel of the line currently being processed is encoded in the arithmetic encoding section based on the results of a comparison of the value of the actual pixel and the pixel (white or black) which is predicted using the model template and the study table.

NOTE

When the lines are judged to match, the line currently being processed is said to be "typical". When the lines are judged to not match, the line is said to be "not typical". When the very first line of an image is predicted, the background color is used as the previous line.

b) In the model template, the combination (10-bit pixel pattern) of 10 pixels is output to the arithmetic encoding section using the template shown below (inside the bold outline).
All of the 10-bit pixel patterns inside this template exist in the study table. This 10-bit pixel pattern is used by the arithmetic encoding section to refer to the predicted value of the pixel and the status number in the study table which correspond to the 10-bit pixel pattern.

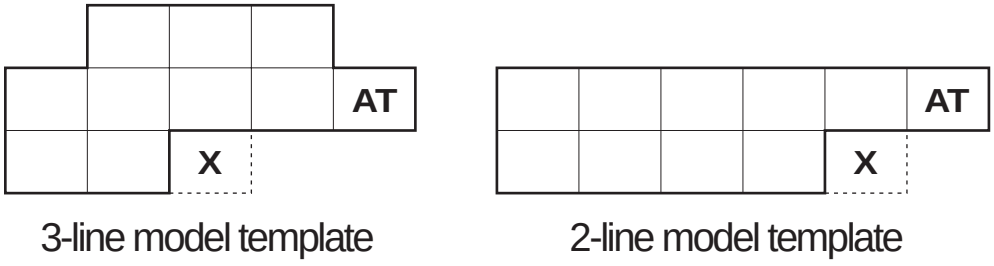


Figure 2-33 Model Templates

NOTE

There are two types of model templates ~ 3-line and 2-line, and the one selected is designated by the LRLTWO inside the Bi-level Image Header section (BIH). The pixel shown by "X" is an encoded pixel and is outside of the template.
The pixel shown by "AT" is a special pixel known as an AT pixel. The AT pixel becomes a Adaptive Template by having its position moved, and is very effective when encoding a periodic pixel, similar to a dither pattern image.
The position of AT in the figure is the beginning position of the AT pixel.
In this fax, it remains fixed in this initial position, so Adaptive Template is not used.

c) The study table, as shown below, is constructed by all of the 10-bit pixel patterns output by the model template, and their corresponding status numbers and predicted values of the pixel to be encoded.
The predicted value of the pixel to be encoded and the status number is compared to the actual pixel in the arithmetic encoding section every time the model template is moved to the adjoining pixel.
The result of this comparison (matches / does not match predicted value) and the status number are then checked by comparison to the probability estimation table, and the study table is corrected (learned) to a new prediction value and status number which will be used when the same pixel pattern is found again.
By learning in this way, the probability of the study table matching the next time is increased, and the need for encoding decreased.

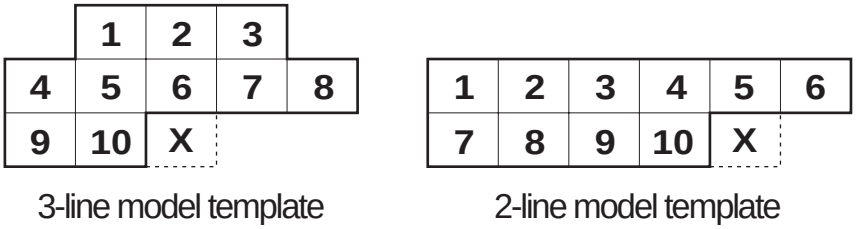


Figure 2-34 Positions of Pixels in Model Template

Table 2-2 Study Table (Initial values)

Pixel pattern in the model template												Predicted value of pixel	Status No. (ST)
Hex	Dec	1	2	3	4	5	6	7	8	9	10		
000h	0	0	0	0	0	0	0	0	0	0	0	0 (white)	0
001h	1	0	0	0	0	0	0	0	0	0	1	0 (white)	0
002h	2	0	0	0	0	0	0	0	0	1	0	0 (white)	0
003h	3	0	0	0	0	0	0	0	0	1	1	0 (white)	0
004h	4	0	0	0	0	0	0	0	1	0	0	0 (white)	0
005h	5	0	0	0	0	0	0	0	1	0	1	0 (white)	0
~													
3FBh	1019	1	1	1	1	1	1	1	0	1	1	0 (white)	0
3FCh	1020	1	1	1	1	1	1	1	1	0	0	0 (white)	0
3FDh	1021	1	1	1	1	1	1	1	1	0	1	0 (white)	0
3FEh	1022	1	1	1	1	1	1	1	1	1	0	0 (white)	0
3FFh	1023	1	1	1	1	1	1	1	1	1	1	0 (white)	0

Table 2-3 Probability Estimation Table

ST	LSZ	NLPS	NMPS	SWITCH
0	5A1Dh	1	1	1
1	2586h	14	2	0
2	1114h	16	3	0
3	080Bh	18	4	0
4	03D8h	20	5	0
5	01DAh	23	6	0
6	00E5h	25	7	0
7	006Fh	28	8	0
8	0036h	30	9	0
~				
49	0706h	79	50	0
50	05CDh	48	51	0
51	04DEh	50	52	0
52	040Fh	50	53	0
53	0363h	51	54	0
54	02D4h	52	55	0
55	025Ch	53	56	0
56	01F8h	54	57	0

ST	LSZ	NLPS	NMPS	SWITCH
57	01A4h	55	58	0
58	0160h	56	59	0
59	0125h	57	60	0
60	00F6h	58	61	0
61	00CBh	59	62	0
62	00ABh	61	63	0
63	008Fh	61	32	0
64	5B12h	65	65	1
65	4D04h	80	66	0
~				
106	50E7h	108	107	0
107	4B85h	109	103	0
108	5597h	110	109	0
109	504Fh	111	107	0
110	5A10h	110	111	1
111	5522h	112	109	0
112	59EBh	112	111	1

ST: Status number in the study table
LSZ: Probability estimation value (range) for inaccurate prediction
NLPS: Next status destination when a prediction is inaccurate
NMPS: Next status destination when a prediction is accurate
SWITCH: Next prediction value reversed if SWITCH=1 when prediction is inaccurate

Example:
A brief explanation of how the study table works is given below.
It is assumed that each of the model template pixels 1~10 in the image below are white.

1. In this case, the model template pixel pattern is 000h.
2. The predicted value of pixel pattern 000h for pixel "X" is "white," but it is actually black. Thus the prediction is "inaccurate."
3. The status ST is "0", so the probability estimation table is consulted, and the next status is moved to "1." At the same time, by the reversal of the predicted value, the next prediction is for "black."

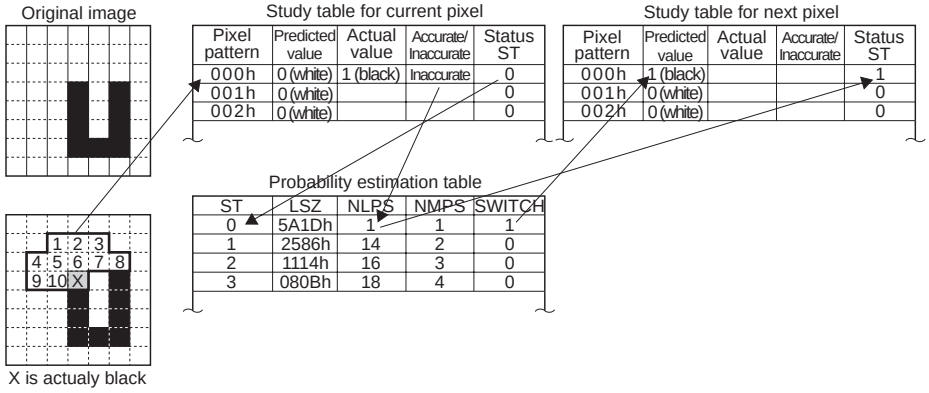


Figure 2-35 Study Table Study Example 1

4. Next, the model template is moved to the adjoining pixel in order to perform the next prediction. At this time, pixels 1~9 of the model template are white, and pixel 10 is black.
5. In this case, the model template pixel pattern is 001h.
6. The predicted value of pixel pattern 001h for pixel "X" is "white," and it is actually white. Thus the prediction is "accurate."
7. The status ST is "0", so the probability estimation table is consulted, and the next status is moved to "1". The prediction for the next pixel remains "white".

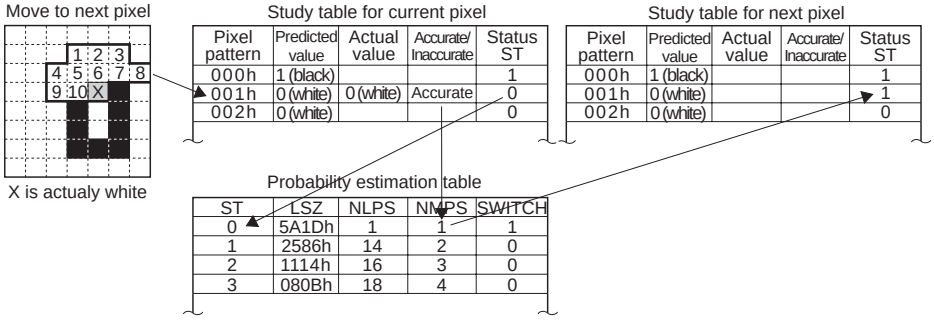


Figure 2-36 Study Table Study Example 2

The study table is constantly updated in this way, increasing the probability of accurate predictions.

d) The probability estimation table, published in the ITU-T T.82. Its contents are fixed, differing from those of the study table.

NOTE

This table shows probability of accuracy/inaccuracy in the form of a range, according to the accurate/inaccurate results of a given status prediction value.
The plan of the probability estimation table is such that if the prediction is accurate, the range of the next status number will be smaller than would be the case in an inaccurate prediction.
The status number with this smaller range will be selected to be the next status number.

e) After the predicted value is found to be accurate/inaccurate by the actual pixel, the model template, and the study table, that accuracy/inaccuracy is encoded in the arithmetic encoding section, and the encoded image data is output.

f) In the encoding (mathematical encoding) done in the arithmetic encoding section, there is no conversion table for encoding as is the case in encoding with conventional MH and MR. Using the LSZ (probability estimation value of an inaccurate prediction: the form of a range) of the probability estimation table and the accuracy/inaccuracy of the predicted value as a base, encoding is done by showing the position of the progress of the prediction on an integer line (between 0~1.0). Encoding shown as a position on this integer line, take a position under MPS in the case of accurate predictions, and under LPS in the case of inaccurate predictions, as shown in the figure below.
Furthermore, there is a concept of range (A) in this arithmetic encoding. This range (A) *2 is shown as an MPS range in the case of accurate predictions and as an LPS range in the case of inaccurate predictions for each pixel. When these ranges (A) are below a certain range *3, the leading edge bit (which excludes the encoding "0". shown by the position on the integer line) shifts one position to the left as encoded image data, and is output. At this time, the limit of this range (A) which was below the certain range is narrow and it is difficult to show a position more detailed than this, so the range (A) is magnified *4 to show it in more detail. This operation is called "Renormalization", and this range (A) is reset to a value above a certain range *3.

The concept of alithmetic encoding is simply explained below.

The following assumptions are made in order to make the explanation easy to understand.

The probability of accuracy will be 50%, and the probability of inaccuracy will be 50%.*1

The area of accuracy will be MPS, and the area of inaccuracy will be LPS.

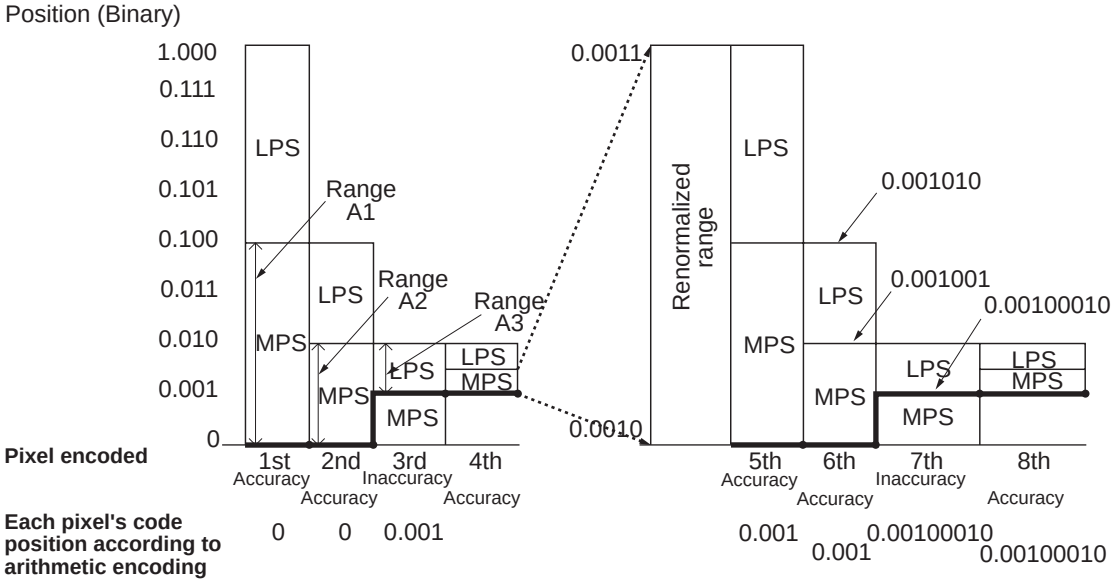
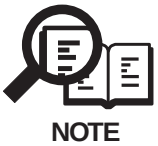


Figure 2-37 Arithmetic Encoding Conceptual Diagram

The special characteristic of this arithmetic encoding is that an additional encoding bit is not needed because the integer line position is the same as the integer line position of the previous encoding data in the case of an accurate prediction. It follows that the amount of encoding will not increase if accurate predictions continue, and the rate of compression will increase. Conversely, with inaccurate predictions, an additional encoding bit will be necessary to show the position of the inaccuracy in detail, and thus the amount of encoding will increase and the rate of compression decrease. In this way, the study table learns in order to increase the rate of accurate predictions and to reduce the amount of encoding and raise the compression rate during the encoding process, and then corrects the table parameters.



NOTE

*1 The actual probability varies with the status because of the extent to which LSZ occupies in the range (A).

*2 The actual range is hexadecimal 8000~10000.
In the case of an accurate prediction, range A1= hexadecimal 10000-LSZ, A2=A1-LSZ, and A3=A2-LSZ.
In the case of an inaccurate prediction, range A=LSZ.

*3 Actually, hexadecimal 8000.

*4 Actually, the hexadecimal value will be shifted to the left two times, and the hexadecimal will be over 8000.

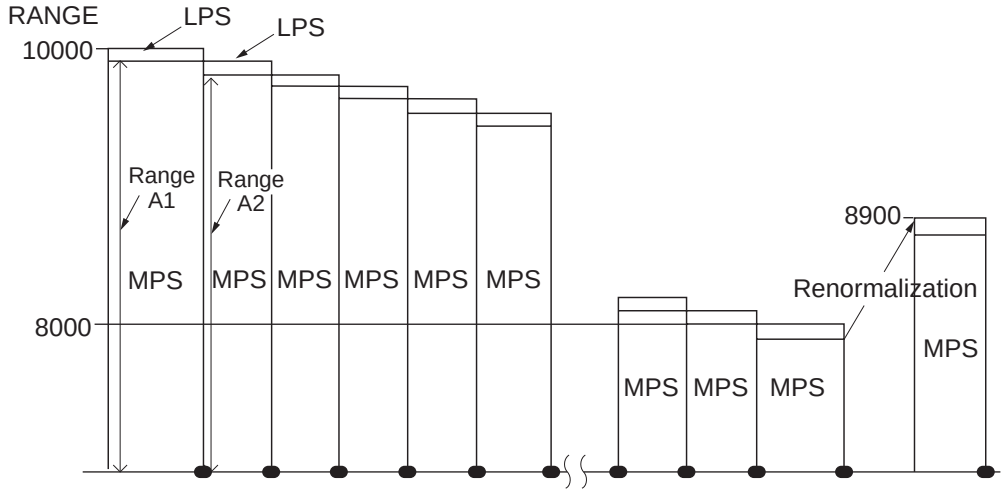
Next, the encoding for continuos accurate predictions will be simply explained.
The assumptions below will be made for easy understanding.

The value of an accurate LSZ will be decimal 100[*1] in all statuses.

Range A will have limits of decimal 8000~10000[*2], and when range A is below decimal 8000[*3], the lead encoding bit will be pushed out, and the encoded image data will be output.

At this time, Range A will be adjusted so that it is over decimal 8000[*3] (decimal 1000[*4] added).

An accurate range will be MPS, and an inaccurate range will be LPS.



Pixel No. encoded	1	2	3	4	5	6		19	20	21		22
Accurate	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes
Encoding position	0	0	0	0	0	0		0	0	0		0
Range initial position	10000	9900	9800	9700	9600	9500		8200	8100	8000	7900	8900
Renormalization											1000	
New initial position											8900	
LSZ	100	100	100	100	100	100		100	100	100		100
Range A	9900	9800	9700	9600	9500	9400		8100	8000	7900		8800
Encoding output	No	No	No	No	No	No		No	No	Yes		No
Output encoding										1bit0		

Figure 2-38 When Predictions are Continually Accurate

In this case, the encoding 1 bit is output for the first time when Range A falls becomes less than 8000 in the 21st pixel.
The following output encoding is shortened and its compression increased.

8.2.4 Construction of image data with JBIG image compression encoding

Images are encoded in block units called stripes, as shown in the figure below.

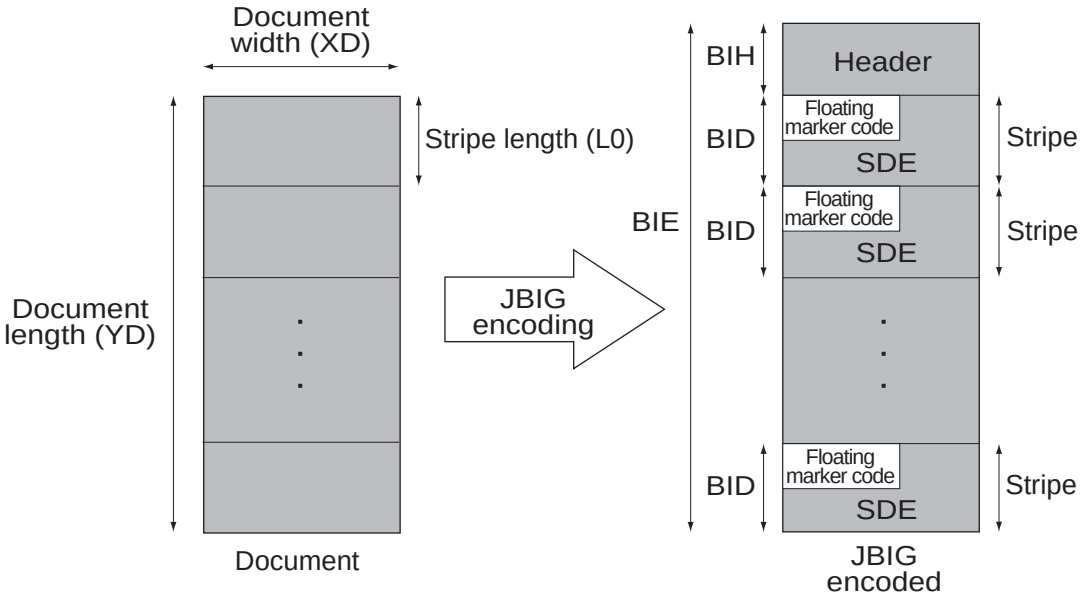


Figure 2-39 Construction of JBIG Image Data

After being encoded, the image data is referred to as BIE (Bi-level Image Entity), and is constructed from the Bi-level Image Header (BIH) section and the Bi-level Image Data (BID) section shown in the figure below.

BIE (Bi-level Image Entity)			
BIH (Bi-level Image Header)	BID (Bi-level Image Data)	· · · · ·	BID (Bi-level Image Data)

Figure 2-40 BIE Construction Diagram

8.2.5 Explanation of bi-level image header section (BIH)

The BIH is shown in the construction figure below. It designates the image size, number of lines per stripe, model template, etc.

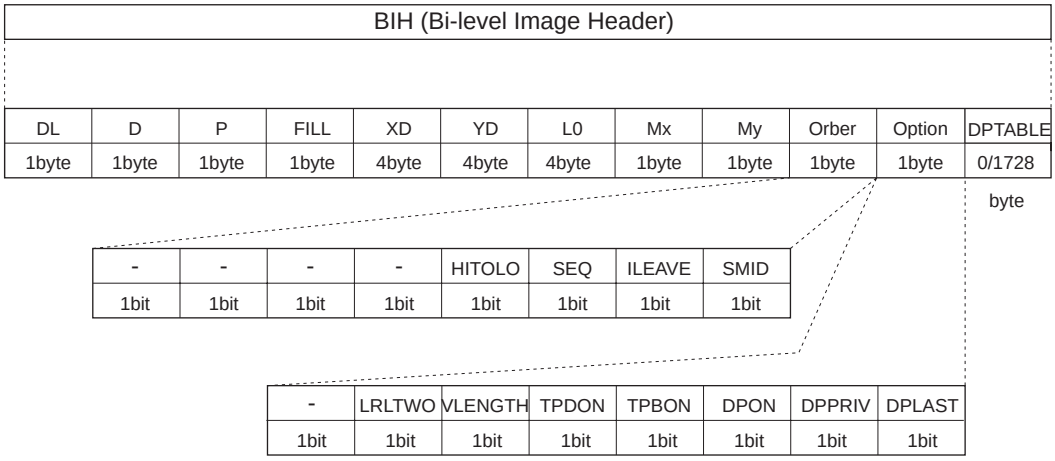


Figure 2-41 BIH Construction Diagram

8.2.6 Explanation and parameters for each symbol used in BIH

The 0x of each parameter shows that the following integers are hexidecimal.

Symbol	Meaning	Parameter	Reference
DL	Initial layer to be transmitted	0x00 fixed	
D	Number of differential layers	0x00 fixed	
P	Number of bit planes	0x00 fixed	
FILL	Fill	0x00 fixed	
XD	Horizontal image size at layer D	0xXXXXXXXX	Document width (No. of bits)
YD	Vertical image size at layer D	0xXXXXXXXX	Document length (No. of bits)
L0	Lines per stripe at the lowest resolution	0xXXXXXXXX	Basically, 1 stripe is 128 lines (0x00000080). Stripes with other numbers of lines are possible when the other machine can receive in option mode.
Mx	Maximum horizontal offset allowed for AT pixel	0xXX	0-127 pixels
My	Maximum vertical offset allowed for AT pixel	0x00 fixed	
Order	The order in which stripe data is attached	Upper 4 bits 0 fixed	
Option	Option	Upper 1 bit 0 fixed	
DPTABLE	Private DP table	0 or 1728 bytes	
HITOLO	Transmission order of differential layers	1 bit 0 fixed	
SEQ	Indication of progressive-compatible sequential coding	1 bit 0 fixed	
ILEAVE	Interleaved transmission order of multiple bit plane	1 bit 0 fixed	
SMID	Transmission order of stripes	1 bit 0 fixed	
LRLTWO	Number of reference lines	1 bit 0/1	0: 3 lines 0: 2 lines
VLENGTH	Indication of possible use of NEWLEN marker segment	1 bit 0/1	Use of 0: NEWLEN not allowed Use of 1: NEWLEN allowed
TPDON	Use of TP for Typical Prediction for differential layers	1 bit 0 fixed	
TPBON	Use of TP for base layer	1 bit 0/1	0: OFF 1: ON
DPON	Use of Deterministic Prediction	1 bit 0 fixed	
DPPRIV	Use of private DP table	1 bit 0 fixed	Has meaning when DPON is 1.
DPLAST	Use of last DP table	1 bit 0 fixed	Has meaning when DPON is 1.

8.2.7 Explanation of bi-level image data (BID) section

BID is as shown in the construction figure below, and consists only of the number of stripes.

BID is constructed by the connection of the floating marker code and the section which includes the actual image data encoded with JBIG image compression encoding, called SDE (Stripe Data Entity).

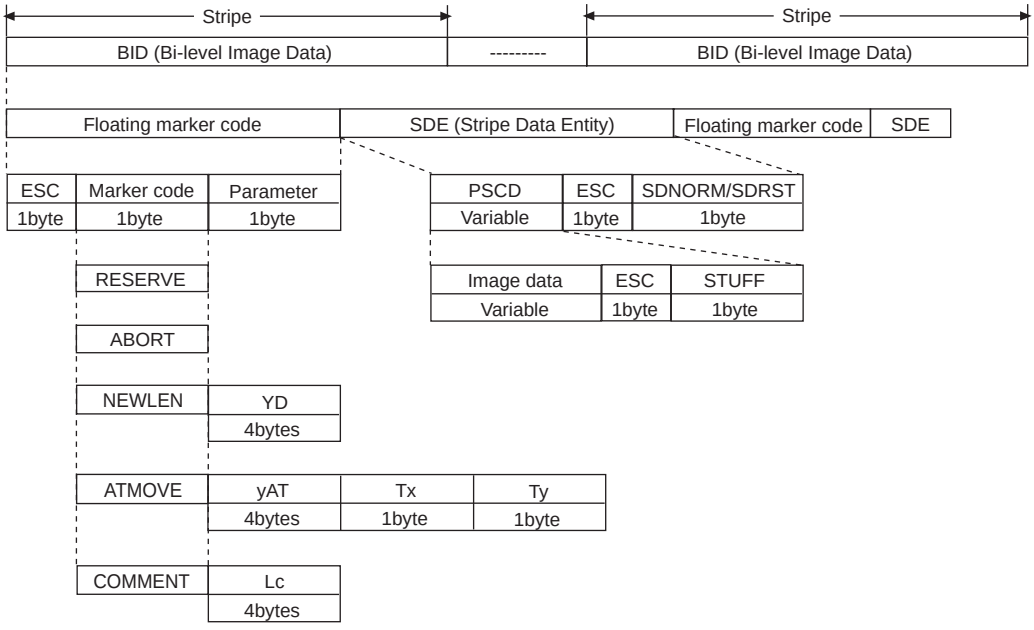


Figure 2-42 BID Construction Diagram

8.2.8 Explanation and parameters for each symbol used in BID

a) Floating marker code section

The floating marker code is set at the head of the stripe data entity (SDE).

In order to distinguish the encoding and the floating marker code, it is imperative that ESC (escape code: 0xFF) be set at the head.

The following marker code and parameters are in the floating marker code.

The 0x of each marker code shows that the following integers are hexadecimal.

ABORT (Abort: 0x05)

Encoding interruption. Only the abort code can be made to appear anywhere.

ESC	0x05

ATMOVE (AT move: 0x06)

Designates from which line the movement of the AT pixel starts, and where it wil move to.

ESC	0x06	yAT:Movement-starting line	Tx:Movement Position(X)	Ty:Movement Position (Y)

COMMENT (Private comment: 0x07)

An optional comment may be added.

ESC	0x07	Lc:Comment length

NEWLEN (New length: 0x04)

Redefine the document length. Only usable when VLENGTH=ON.

ESC	0x04	YD:Document length

RESERVE (Reserve: 0x01)

Only usable for characteristic use.

ESC	0x01

b) Stripe data section

PSCD (Protected stripe encoding data)

The actual image data encoded with JBIG image compression is included in PSCD by the section remaining after the last 2 bytes from SDE, ESC and SDNORM or SDRST are omitted.

Image Data

The actual image data encoded with JBIG image compression.

STUFF

Image data is a variable, so STUFF:0 (zero) is adjusted by continuous sending so that the image data can be arranged into byte units or word (2 byte) units.

SDNORM (Stripe data completion: 0x02)

Shows the completion of stripe data

ESC	0x02

SDRST (The reset at completion of stripe data: 0x03)

Shows the completion of stripe data. Everything including the study table and the ATMOVE are reset.

ESC	0x03

NOTE

When the image data encoding is 0xFF, it is imperative to attach 0x00 after the image data encoding 0xFF in order to distinguish ESC(0xFF).

8.3 Color Scanning Ability

8.3.1 Contact sensor specifications

Effective reading width

214 mm

Effective number of picture elements (pixels)

2552 pixels

Scanning rate

When color scanning	30~600 dpi: 9.9 ms / line
When color copying	360 dpi fixed: 9.9 ms / line

Pixel density

300 dpi

Data Output

1 analog output

Rod lens array

Single row type

Light source

Red, Green and Blue LED's mounted on one side of scanner

8.3.2 Reading color documents

When scanning a line of a color document, the LED's are sequentially lit: first Red, then Green, then Blue. The corresponding image data of the line are then read and stored to memory. The Red, Green and Blue LED's are mounted on the white LED board at the right side of the contact sensor. The light emitted from the LED's passes through the optical guide, where it is reflected, gathered, and projected at the document.

During color copying, the SPCNT board's system control IC (IC 4) uses the 8-bit data stored in memory for each LED color to generate print image data for the colors Cyan, Magenta, Yellow, and Black (CMYK data). Generation of CMYK data is independent from the reading contact sensor data. When CMYK data generation is slower than the reading process, reading is halted until CMYK data generation is completed.

When using the unit as a color scanner, the Red, Green and Blue data which were scanned and stored to memory are converted to parallel data and sent to the PC via the Centronics interface.

8.3.3 Reading black & white documents

When scanning black and white documents, the Red, Green and Blue LED's are lit sequentially for 1/3 the duration used for color scanning, providing illumination equivalent to the same duration of white light.

8.4 MultiPASS Function

Installation of the enclosed “MultiPASS Desktop Manager for Windows” into a PC allows MultiPASS to use the main unit as a scanner, printer, PC fax, plain paper fax, and copy machine.

8.4.1 Specifications

a) PC Fax

Fax / Phone Book - Yes

b) Scanner

Gradations

Grayscale : 256 gradations
Full Color : 16,777,216 colors

Scanning Resolution

Standard resolution 300dpi
Extension 30 - 600 dpi

TWAIN Standard

Conforms

Scanning Speed

See page 1-4, “Scanning line density & scanning speed”

c) Printer

Type

Serial Color Bubble Jet method

Built-in Print Control Mode

Canon extended mode (native mode)
(Canon extended mode shall be selected when the MultiPASS printer driver is used.)

Print Direction

Bi-directional (Changes automatically according to print data)

Paper Size

A4 (210mm × 297mm)
A5 (148mm × 210mm)
Letter (216mm × 279mm)
Legal (216mm × 356mm)

Envelope Size

Envelope U.S. commercial, number 10 (4.1" × 9.5")
Envelope european DL-size (8.66" × 4.33")

Paper Tray Capacity

Normal A4/Letter/Legal size : Maximum thickness 10mm (Approx. 100 sheets, when using 75g/m^2)
Envelopes : 10 (U.S. Commercial No.10, European DL)
OHP film : 50 sheets

Paper Types

Plain paper
Bubble Jet paper (Canon LC-301)
High resolution paper (Canon HR-101/101S)
Glossy photo paper (Canon GP-201)
Transparencies film (Canon CF-102)
Back print film (Canon BF-102)
High Gloss film (Canon HG-101)
Fabric Sheets (Canon FS-101)
Envelopes (U.S. Commercial No.10, European DL)

Line Feed Speed

Approx. 150 ms/line (with 128/360 inch line feed)

Printing Speed

Color BJ cartridge BC-21e (color printing) : 2.0 pages/min. (HS), 1.5 pages/min. (HQ)
Color BJ cartridge BC-21e (BW printing) : 4.5 pages/min. (HS), 3.8 pages/min. (HQ)

Printing Width

Maximum 203.2 mm

8.4.2 Bi-directional centronics interface

a) Specifications

This parallel interface performs data transmission 8 bits (1 byte) at a time, and conforms to TTL.

Interface Type

IEEE P1284-B/Bi-directional parallel

Data Transmission

8 bit parallel interface (IBM PC or compatible machine)

Simultaneous Signal

STROBE signal from the computer

Handshake

BUSY/ACKLG

Interface Connectors

Printer side	Amphenol 57-40360 or compatible
Cable side	Amphenol 57-30360 or compatible

Recommended Interface Cable

Type	Twisted-pair shield cable
Materials	AWG No. 28 or larger
Length	Up to 6.56 feet (2.0 m)

Signal Voltage Level

Low level	0.0V to +4V
High level	+2.4V to 5.0V

b) Interface Functions

This machine supports 3 bi-directional Centronics modes - compatible mode, nibble mode, and ECP mode. These are included in IEEE-P1284 D2.00, which was published on September 10, 1993. Where the host computer supports ECP mode, this machine will transfer data in ECP mode. When the host computer does not support ECP mode, this machine will transfer data in compatible mode and nibble mode. Some host computers must have ECP mode set.

Compatible Mode

This mode conforms to conventional Centronics interfaces. The host computer transfers 8 bit-data (in sequential direction) a peripheral machine in 8 data lines.

Nibble Mode

A peripheral machine transfers data to the host computer with this mode. The 8-bit data is divided into 2 4-bit units, and transfers the 4-bit data to the host computer 1 unit at a time by 4 control lines.
Bi-directional transfer can be accomplished by simultaneously using both of the methods mentioned above - compatible mode (sequential direction transfer), and nibble mode (reverse direction transfer).

ECP Mode

ECP stands for Extended Compatibility Port. High-speed data transfer can be accomplished with ECP mode. Data can be transferred faster than in nibble mode because data lines can be used in both directions without changing modes. Optionally, transfer of compressed data can also be done.

8.5 Color Communications

A scanner capable of color scanning and a printer capable of color printing are combined, and a color document is transmitted/received. Communication procedures are basically the same as conventional ECM communications procedures, but the JPEG compression encoding method used in the compression of color images is adopted as the compression method. This machine is capable of full color image transmission/reception through conformation to the ITU-T standard. Because it conforms to the ITU-T standard, it can communicate with other manufacturer's machines.

8.5.1 Specifications

Corresponding Standards	ITU-T T.30 ANNEX (JPEG color communications standard) ITU-T T4 ANNEX E (Standard relating JPEG headers) ITU-T T.42(Color spacing standard for FAX) ITU-T T.81(JPEG Standard)
Scanning document size	A4
Recording paper size	A4
Resolution	200dpi × 200dpi
Pixel / Composition elements	8bit
Color encoding method	JPEG
Color spacing	CIELAB color spacing
Illumination data	CIE standard illumination D50
Sub-sampling method	4:1:1 (=Lab)
Number of colors	24bit
Image mode	Standard, fine (by changing quantization parameters)

NOTE

CIELAB color spacing

In the JPEG compression used in G3FAX, it is necessary to compress/decompress images with color spacing called L*, a*, b*. CIELAB is defined color spacing by CIE (Commision Internationale de l'Eclairage). It is the space which holds the optically near-equivalent and distinguishable difference in the interval between points of equal space. Here, L* shows the brightness (luminosity index), and a* and b* show the variation in color (a* shows tones from green to red, b* shows tones from blue to yellow.)

L*,a*,b* are the color ranges expressed by real numbers determined as shown below:

L*=[0, 100]
a*=[-85, 85]
b*=[-75, 125]

It is inconvenient to digitally process this as-is, so the colors are handled by rounding off the values to the closest integer. The method used to calculate expressions for 8bit pixels is as below.

L=(L*)*(255/100)
a=(a*)*(255/170)+128
b=(b*)*(255/200)+96

Sub-sampling

The smallest unit processed by JPEG is called the MCU (minimum coded unit). This is an image unit of 16 × 16 dots. Also, the MCU is separated into L*/a*/b*, and the resulting 8 × 8 dots units are called blocks. The sample ratio called 4:1:1 means the information returned when L* is compared with 4 blocks and a* and b* with one block sections.This a* and b* get information by taking the average value from the 4 pixels around them. This makes use of the characteristic of human eyes that they are sensitive to brightness and insensitive to variations in color.
This process is called sub-sampling.

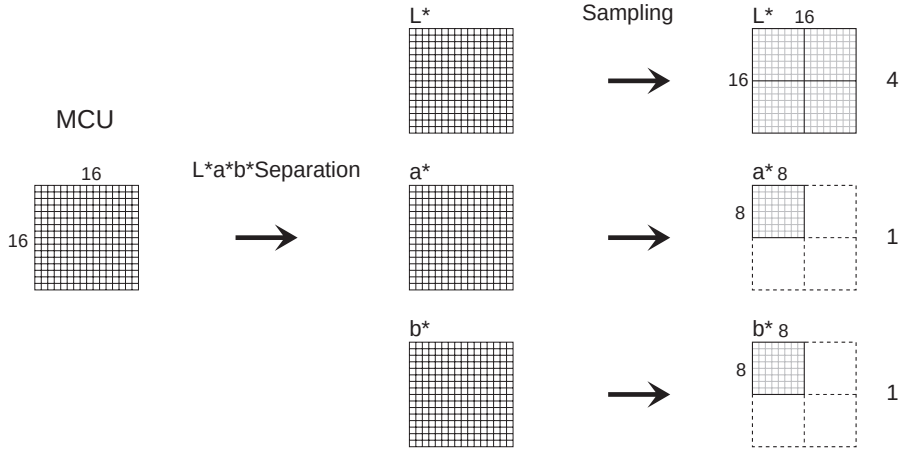


Figure 2-43 Sub-Sampling

8.5.2 The JPEG encoding method

The JPEG encoding method (called JPEG below) originated from the group named "Joint Photograph coding Experts Group," which is a technical organization formed by ISO and ITU-T, and is an encoding method which is widely popular in the computer world as a method of compressing full color still image data.

As an outline, JPEG processing compresses images in 3 levels: DCT conversion, quantification, and entropy compression. JPEG decompression makes an image reappear by following the 3-step procedure in reverse: entropy compression, quantification, and reverse DCT conversion. The compression ration of JPEG image data depends on the type of image, however compression to a degree of 1/7 to 1/30, undetectable to the naked eye, is possible. However, since the parts of the data which do not affect the viewing eye are discarded at the time of compression, it is impossible to restore the image to its 100% original condition when de-compressing. The characteristic of this type of compression is called bad reverse compression method, and is one of the biggest characteristics of JPEG. Other characteristics of JPEG are emphasis on image quality by change in sample comparision and quatization paramaters, and the merit of being able to choose the compression ratio at the time of compression.

NOTE

Discrete Cosine Transformation (DCT)

DCT is a transformation by the below method.

DCT Transformation

$$F(u,v)=\frac{2C(u)C(v)}{N}\sum_{i=0}^{N-1}\sum_{i=0}^{N-1}f(i,j)\cos\left\{\frac{(2i+1)u\pi}{2N}\right\}\cos\left\{\frac{(2j+1)v\pi}{2N}\right\}$$

Reverse DCT transformation

$$f(i,j)=\frac{2}{N}\sum_{i=0}^{N-1}\sum_{i=0}^{N-1}C(u)C(v)F(u,v)\cos\left\{\frac{(2i+1)u\pi}{2N}\right\}\cos\left\{\frac{(2j+1)v\pi}{2N}\right\}$$

$$C(w)=\frac{1}{\sqrt{2}}\quad(w=0)$$

$$=1\quad(w\neq 0)$$

Figure 2-44 Discrete Cosine Transformation

For an 8×8dot image, DCT transformation dissects the image into cos(nπ/16), (n=0,1,2,.....,7) wavelengths both length-wise and width-wise.

For natural images such as pictures etc., when doing wavelength dissection in this way, it has the property of concentrating a comparatively small number of pixels, and giving the other pixels a value close to zero. Even if the pixels close to zero approximate zero, the an image close to the original image can be made to reappear by only the left over pixels. When this transformation is done, low frequency elements gather at the upper left, and high frequency elements at the lower right.

The characteristics of the JPEG method which are used in ITU-T color communications are shown below.

(1) Can effectively compress data for natural images to that the image quality is minimally affected.

(2) Little noise appears on the boundaries of such images as images and text with borders, monochrome illustrations, etc., and artificial images with clear contrast.

(3) Color spacing adopted from the CIELAB method.

(4) For compatibility with Faxes which do not the width of the scan when starting to scan, a 0 is inserted in the section which shows the number of lines in the scanning width, which is in the SOF0 marker in the JPEG header, and transmission begins. The scanning width is conferred to the receiving side by the addition of a code to the end of the JPEG data which determines the number of lines in the scan, called the DNL marker, which is added to the compressed image data after transmission.

(5) In order to tell the receiving side that it is an image compressed by the G3 facsimile, information such as "G3FAX" as an application name, "200dpi" as a resolution, etc. is set in the JPEG header APP1 marker.

JPEG data is composed of a header section which includes several pieces of information which are necessary for decompression of the image, as well as the section containing the data of the image itself, which is DCT transformed, quantified, and entropy compressed. The header section is comprised of several tables called segments, and 2 bytes of encoding, called a marker, which show the contents of the table, are attached at the head of the segment.

Markers are expressed by "0xFF" and the 1-byte combinations of values peculiar to each marker, so by reading these, the marker and its connected paramaters can be interpreted. These markers are defined by ITU-T T.81.

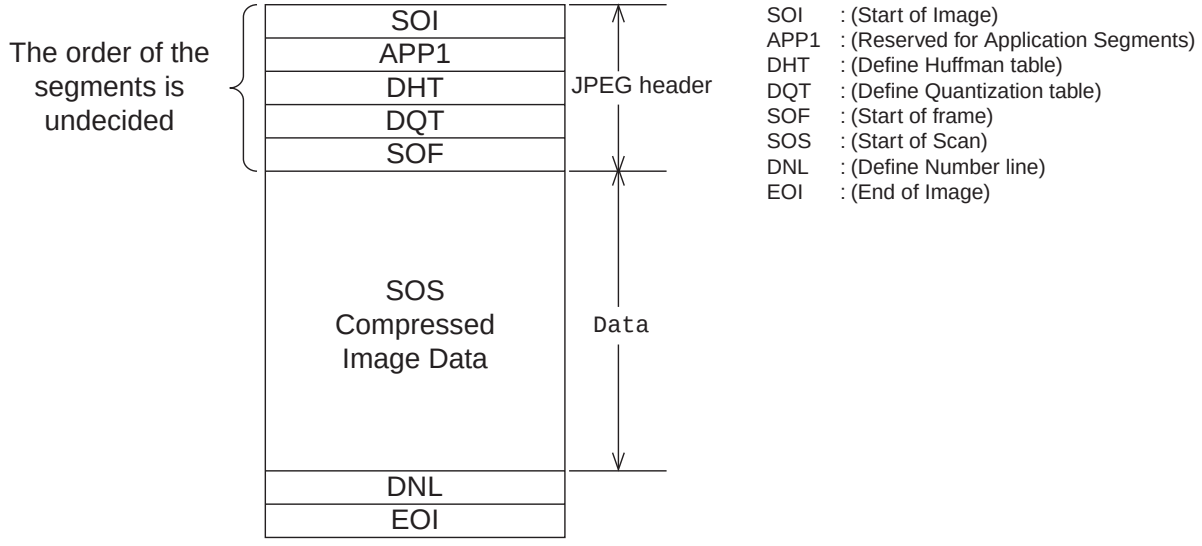


Figure 2-45 JPEG Data Structure

8.5.3 Image processing outline

(1) Images scanned by the color contact sensor are read into memory as RGB data.
(2) The read RGB data undergoes color transformation processing, and is converted to L*a*b* data. Also, after this processing, it is changed into 16x16dot elements called MCU.
(3) Using the fact that the human eye is sensitive to changes in brightness and insensitive to changes in color, the resolution of a* and b* is roughened and the amount of information lessened without affecting the image which is seen by the human eye.
(4) Each block undergoes DCT transformation and the image data is separated into 64 cos waves.
(5) Photos of natural images, etc, have characteristically high numbers of low-frequency elements and low numbers of high-frequency elements. Because of this, an operation table (quantization parameter) is used in which low-frequency elements are left and high-frequency elements are reduced, and unnecessary sections are compressed.
(6) The compressed data is made in a single dimension facing from the upper left to the lower right., and this is encoded with Huffman encoding using a special Huffman table.
(7) The data which has finished being encoded is transmitted in ECM mode using a modem.
(8) At the receiving side, the original image is decompresses using the information in the JPEG image header. First, decoding is done using the Huffman table included in the header. After that, the image is made in two dimensions, facing from the lower right to the upper left.
(9) Reverse quantization is performed using the quantization parameter in the header. During quantization, the high-frequency elements which have little effect on the image seen by the eye are lost, so the original data is not perfectly restored.
(10) Inverse Dispersal Cosine Transformation (IDCT) is performed, transforming into L*' a*' b*' data. Sub-sampling is done at the time of transmission, so the amount of a*', b*' data is 1/4 that of l*' data.
(11) The L*'a*'b*' data has color transformation processing done, is converted into RGB data (R'G'B'), and stored in memory.
(12) The converted RGB data is transformed into dual-value CMYK data for printing, and printed out with the BJ printer assembly.

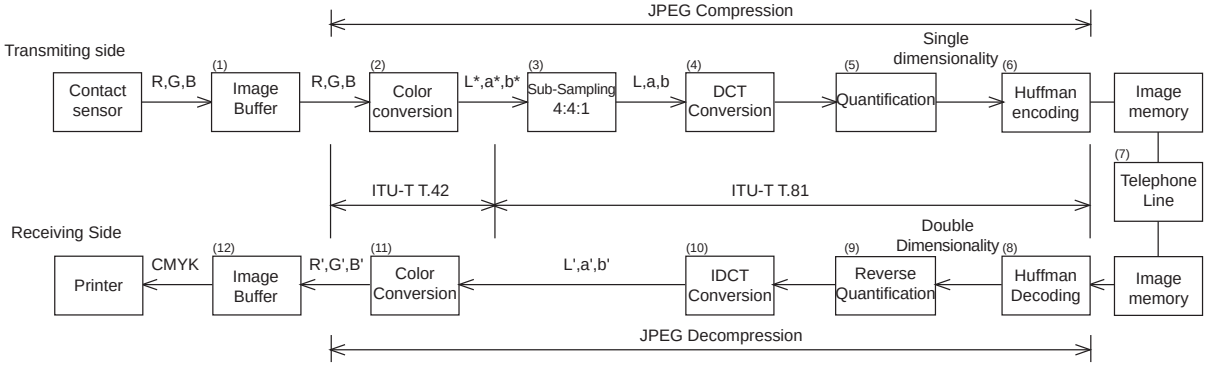
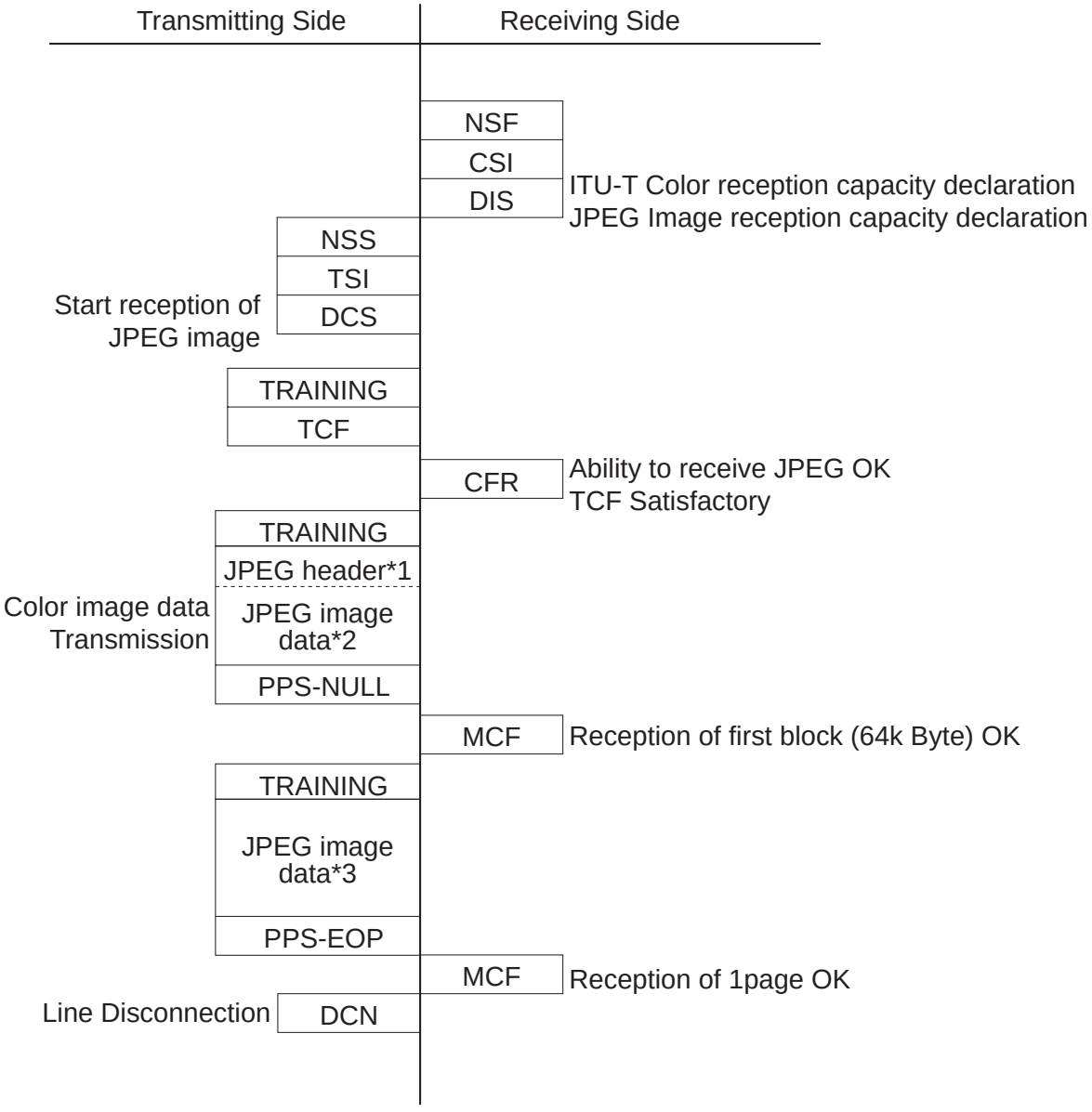


Figure 2-46 Image Processing Out

8.5.4 ITU-T color transmission protocols

The general protocols for ITU-T color transmission are shown below.



1* Infomation necessary for the width is obtained from the application name Which shows G3FAX, the image size, image resolution, sub-sampling, quantization paramaters, Huffman encoding table, etc, obtained from the JPEG header.

2* The image data encoded by huffman encoding, after DCT transformation.

3* Image data not found in the ECM block. A marker which shows the scanning width is altached to the end of the image data.

Figure 2-47 ITU-T Color Protocol

The receiving side declares with the DIS signal that it has the ability to communicate in color conforming to the ITU-T standards and that it supports the JPEG encoding method. After confirming the receiving machine's ability to communicate in color, the transmitting side gives instructions to receive as a JPEG-compressed color image with DCS.
After this, error-free transmission of the JPEG-encoded image data is done by the interior modem with high-speed data communications following the ECM procedure.

8.5.5 Conditions necessary for ITU-T color transmission

This machine is not compatible with optional functions which support only functions necessary for JPEG color communication done with ITU-T T.30 ANNEX E.

The following items are necessary capabilities.
· 8bit/Pixels/Components
· Gray scale reception ability
· Lab color spacing
· 4:1:1 sub-sampling
· CIE Standard Illuminant D50
· Default gamut range
· A4 size document

Bit definition for DIS/DCS related to ITU-T color communications is shown below.

Table 2-4 DIS/DCS bit definition

DIS/DCS bit No.	1	0	Description
bit 68	**Function**	No Function	JPEG encoding method
bit 69	**Function**	No Function	ITU-T color communications ability
bit 71	12 bit	**8bit**	1 pixel construction element
bit 73	1:1:1	**4:1:1**	Sub-sampling ratio
bit 74	Other than D50	**Using D50**	Using other than CIE standard illuminant D50
bit 75	Other than default	**Default**	Using other than default gamut range

NOTE

This machine has "1" for only bits 68 and 69.

8.5.6 Operations where other machine does not have color communications ability

When sending a color FAX where the other machine does not have color communications ability, this machine informs the user by displaying **"TRY AGAIN IN B/W"** (#085).
In other words, it judges whether or not the other machine can receive in color according to the DIS from the receiving machine. It does not automatically switch to BW and re-send. The following measures are necessary for the user to deal with this situation depending on the other machine.

1. When the other machine is a BW FAX

The other machine can only receive BW images, so re-send as a normal BW Fax.

2. When the other machine is an ITU-T color communications-compatible FAX

The other machine is set to disallow color reception, or it is possible that color reception temporarily cannot be done for some reason, so re-send after having the other party check the settings and set them to allow color communication.

8.5.7 Conditions necessary for color reception

User data, types of installed cartridges, etc. Determine whether or not this machine can receive in color as a transmitting machine. A necessary condition is that **COLOR RX** be set to **ON**.

Condition 1 : With COLOR RX ON and MEMORY RX OFF

Receives in color when printing can be done with a BC-21e cartridge installed. Color reception cannot be done if a cartridge other than a BC-21e is installed, or if a no color ink error has been detected, etc.

Condition 2: With COLOR RX ON, MEMORY RX ON

If memory reception is possible, memory reception can be done in color regardless of the type of cartridge installed.

NOTE

When the settings in Desktop Manager are set to forward received data to a PC, memory reception can be done even if **MEMORY RX** is **OFF**.

NOTE

Forced printing using a cartridge other than a BC-21e BJ cartridge

Images received by color transmission cannot be automatically printed with a BJ cartridge other than the BC-21e. If a cartridge other than the BC-21e is installed, **"CHANGE BC-21e"** will be displayed, and memory reception will be done. With this machine, color images received by memory reception may be output according to the user operation. Output of images is done by choosing the desired TX/RX No. from the Memory reference function's **PRINT DOCUMENT** menu.

8.5.8 Specifications for Color Communications

The operations for color communications shown below are specifications, so please take care when fielding questions from users.

Transmission Specifications

- Even if the **Color/Black** button is pressed and the display changed between pages during transmission, pages of BW images and pages of Color images cannot be mixed.
- Image transmission of JPEG grayscale is not possible.
- Even when **ECM TX** settings are **OFF**, this setting is ignored for color transmission, and transmission is done automatically by ECM.
- The TTI header attached to the head of the color image is an image compression specification added when scanning, so the time is the scanning time, not the time that transmission actually begins. This differs from BW transmission.
- Two types of transmission mode for color transmission can be chosen: STANDARD and FINE. These are changed by the compression ratio, depending on the quantization parameter. This varies according to the image, but transmission in STANDARD takes approximately half the time compared to FINE mode.

Reception Specifications

- In the **TX REPORT** settings, even when **PRINT WITH IMAGE** is set to **ON**, the color-transmission image is not attached. Instead a "The color fax image is not printed on this report" message is printed.
- Grayscale JPEG images sent from machines of other companies can be received.
- When an error indicating no color ink appears, a BW FAX is not automatically output even if there is black ink available.
- When the **ECM RX** setting is **OFF**, color reception is not performed.

Other Specifications

- With framed tables, text, monochrome illustrations, etc. And sharp contrast artificial images, a small amount of noise may occur in the image border.
- Color transmission are not supported in V3.01 of Desktop Manager.
- Because **RX REDUCTION** becomes **ON** when the default setting **BOTTOM MARGIN** is set to **NORMAL**, the scanning width is reduced.

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1. MAINTENANCE LIST

1.1 Consumables

Level	Consumable	When
User	BJ cartridge (BC-20/BC-21e/BC-22e)	When **"CHANGE CARTRIDGE"** is displayed or when ink has run out.
	INK cartridge (BCI-21 Color /BCI-21 Black)	When using BC-21e, and either the "YMC color" or "Black" ink cartridge has run out.
Service Technician	None	

1.2 Cleaning

For the cleaning procedure, see *2. HOW TO CLEAN PARTS on page 3-4*.

Level	Location	When
User	Main unit outer covers	When dirty.
	Printer platen	When ink adheres to the platen.
	Separation roller	When document separation performance deteriorates.
	Document feed/eject roller	When document feed/eject performance deteriorates.
	Separation guide	When document separation performance deteriorates.
	Scanning glass (contact sensor)	When black vertical stripes appear in copied or transmitted images.
	White sheet	When the color or brightness of the copied or transmitted image is not normal.
Service Technician	None	

1.3 Periodic Inspection

None

1.4 Periodic Replacement Parts

None

1.5 Adjustment Items

The following adjustments must be made on this fax.
For the adjustment procedure, see *3. ADJUSTMENT on page 3-6.*

Item	When
CS LED lights-on duration adjustment	When the SPCNT board, or the lithium battery, or the contact sensor are replaced. Also, when the color or brightness of the copy image or transmission image is not normal.
Vertical Alignment adjustment	When the vertical lines shift during Bi-directional printing.

NOTE

Automatic adjustment of CS LED lights-on duration

The CS LED lights-on duration, which can be adjusted via button operation, is also adjusted automatically in the following cases:

- **When power is turned ON then SRAM data is corrupted**

  When this product is shipped, after factory adjusment of the CS LED light-on duration, the exposure control data is stored in SRAM. Because this data is preserved by the Lithium battery even if the power supply is shut off, further adjustment is unnecessary in almost all cases. When the machine's power switch is turned on, the data stored in SRAM is checked for correctness by Checksum, and if any data in SRAM has been lost, adjustment of CS-LED lights-on duration is automatically performed at that time. At first, a check is done for the presence/absence of a document, and if there is no document, exposure control is performed automatically. Exposure control data measured after this is stored in SRAM. When a document is present, scanning is done in an error condition, an abnormal image is output, and the contact sensor is aware that there is an abnormality.

1.6 General Tools

Tool	Use
Phillips screwdriver	Removing/inserting screws
Flat bladed screwdriver	Removing/inserting screws
Precision Phillips screwdriver	Removing/inserting screws
Precision flat bladed screwdriver	Removing plastic tabs
Tweezers	Removing coil spring
Isopropyl alcohol (IPA)	Cleaning the cleaning location
Pliers, needle nose	Driving retaining ring

1.7 Special Tools

Tool	Use	Part No.
Grease (FLOIL G311S)	Apply to specified parts	TKC-0953
Grease (IF-20)	Apply to specified parts	CK-8006
Grease (PG-641)	Apply to specified parts	CK-0562
Grease (PERMALUB G No.2)	Apply to specified parts	CK-0551
Cover opener	For opening the upper cover	HY9-0021

NOTE

Cover opener

The Cover opener (round-tip screwdriver) has been set as a special tool, but any precision screwdriver with a tip diameter of 1.5 mm or less would do instead. If using a substitute, be careful not to scratch any surfaces. See *page 1-51.*

2. HOW TO CLEAN PARTS

2.1 Main Unit Outer Covers

Wipe with a dry, soft cloth.

2.2 Separation Roller

Open the operation panel, and wipe with a dry, soft cloth.

2.3 Document Feed/Eject Roller

Open the operation panel, and wipe with a dry, soft cloth.

2.4 Separation Guide

Open the operation panel, and wipe with a dry, soft cloth.

2.5 Scanning Glass (Contact Sensor)

Open the operation panel, and wipe with a dry soft cloth.

2.6 White Sheet

Open the operation panel, and wipe with a dry soft cloth.

2.7 Printer Platen

Open the Printer cover, and wipe with a cloth moistened with a little water.

NOTE

If the parts above are very dirty, wipe with a cloth moistened with IPA (isopropyl alcohol).

Do not use tissue paper. Dust from the tissue paper causes static electricity.

Precautions when Using IPA

When cleaning with IPA, take care to prevent the IPA from splashing high-temperature parts. If IPA splashes high-temperature parts, leave for at least three minutes to allow the IPA to evaporate.

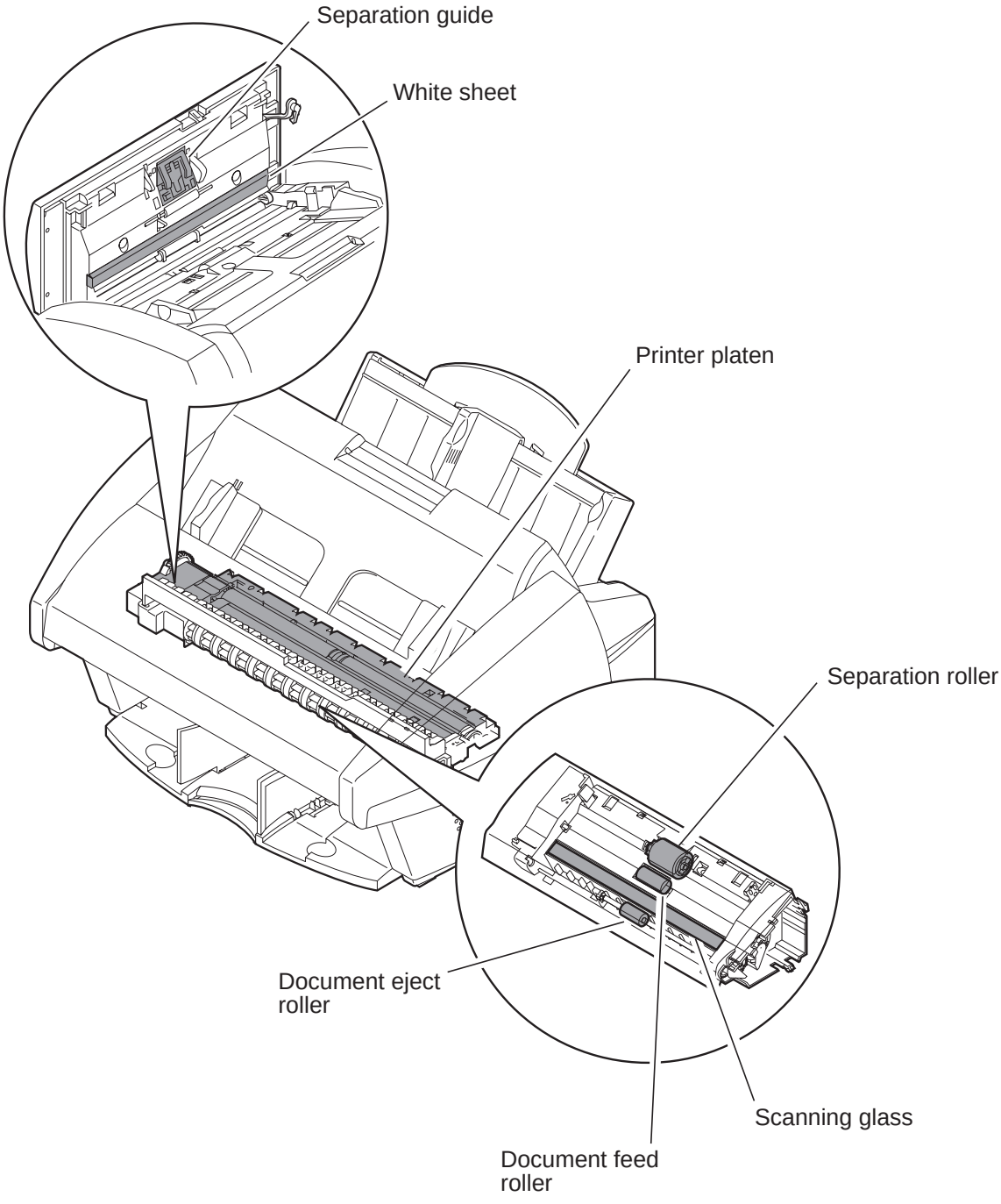

Figure 3-1 Cleaning Location

3. ADJUSTMENT

3.1 CS LED Lights-on Duration Adjustment

a) Overview

This adjustment is used to eliminate uneven scanning which can result from variations in light intensity between individual LED's. Performing the adjustment will therefore have an effect on scanned and copied images.

The adjustment value is registered in an SRAM IC which has lithium battery back-up and will not be lost even if power is turned off. However, the SRAM data can become damaged, for example by battery depletion. In this case, the machine checks the data's validity the next time power is turned ON. If the data is invalid, the adjustment is made automatically. If, at this time, the DES detects a document, an abnormal image is output, and the contact sensor is aware that there is an abnormality. After the document is removed, the message **PRESS Start/Scan** is displayed. When the **Start/Scan** button is pressed, the machine performs the adjustment once again. Because the user is automatically prompted, it is almost never necessary to perform this adjustment during normal use. However, if the SPCNT board, Contact sensory ass'y, or lithium battery is replaced, be sure to perform this adjustment. Also, if the color or brightness of scanned or copied images is faulty, performing this adjustment may correct the problem.

b) Procedure

(1) Check that the operation panel is closed correctly, then perform the adjustment by following the steps described below.

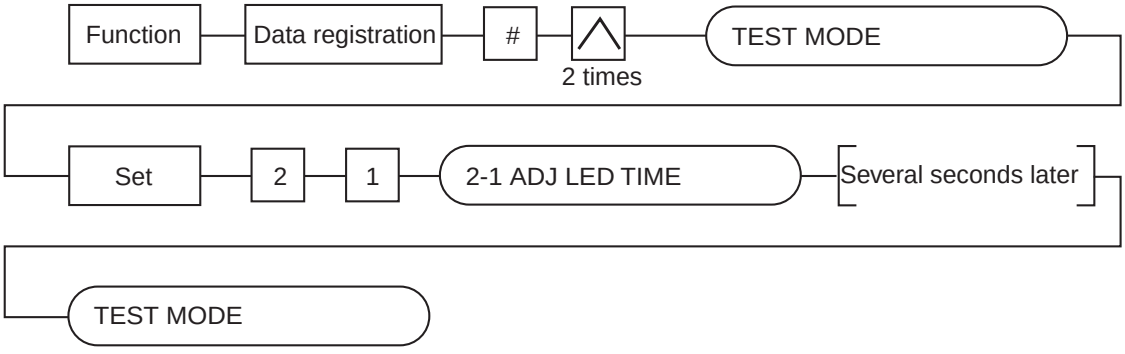

Figure 3-2 CS LED Lights-on Duration Adjustment Operation

(2) The adjustment procedure is finished when the display reads **TEST MODE**.

3.2 Vertical Alignment Correction

a) Overview

Vertical alignment during bi-directional printing can be corrected by adjusting the print starting position. No tools are required for this adjustment.

b) Printing the test pattern

Follow the procedure below to print out the test pattern.

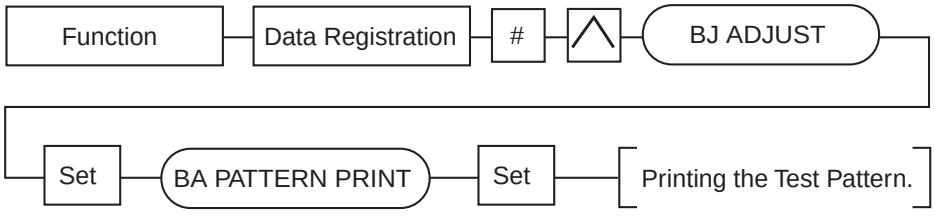

Figure 3-3 Printing the Test Pattern

NOTE

The test pattern can be printed only when Black BJ Cartridge (BC-20) and Color BJ Cartridge (BC-21e) are used. Photo Color BJ Cartridge (BC-22e) cannot be used.

c) How to read the Test pattern

As shown in *Fig. 3-5*, the test pattern shows the SHQ, SHQ2 (Not used), HQ (normal mode), HS (economy mode) and uni-direction printing condition from the top. The respective vertical lines for HQ and HS can be moved left or right on the second row (of three rows). As shown in *Fig. 3-6*, adjust so that the vertical lines in the middle are correctly aligned.

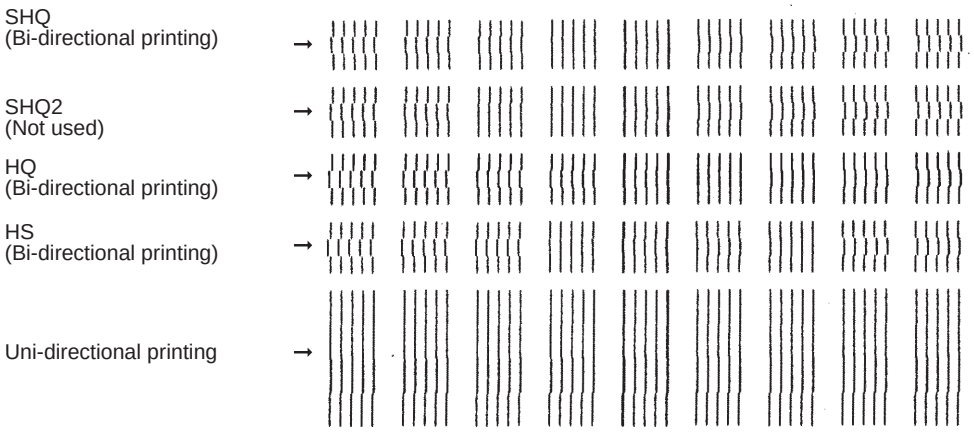

Figure 3-4 Test Pattern Sample

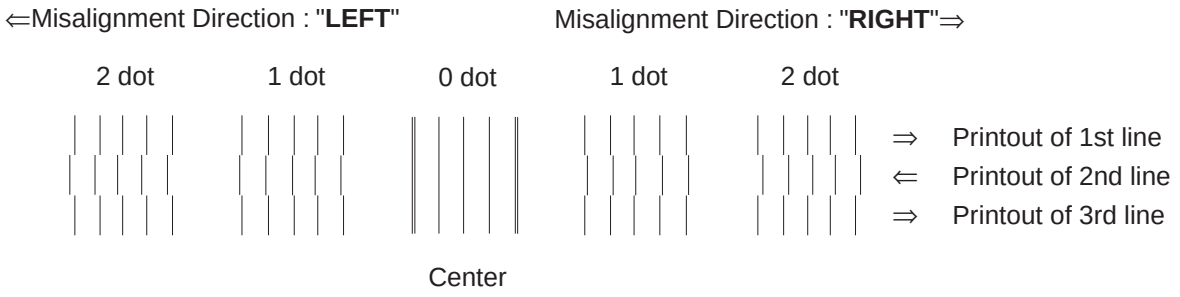

Figure 3-5 Correct Test Pattern

d) Correction procedure

The misaligned vertical lines in the middle, shown in *Fig. 3-6*, are described below.

(1) Check the correction direction for the 2nd line, and check the dot count. (In the example, a 2-dot correction to the right is necessary.)

(2) Determine the dot count required for the correction.
In SHQ, the dot count is roughly 4.55 times. (E.g., $2 \times 4.55 = 9$)
In HQ, the dot count is roughly 2.86 times. (E.g., $2 \times 2.86 = 6$)
In HS, the dot count is 2 times. (E.g., $2 \times 2 = 4$)

(3) As shown in *Fig. 3-7*, make the correction for all print mode. (The flowchart shows the procedure for making a 2-dot correction to the right for the all print mode, respectively. The actual display may look different from the figure.)

(4) After making the correction, print out the test pattern. If there is any misalignment, do the correction again.

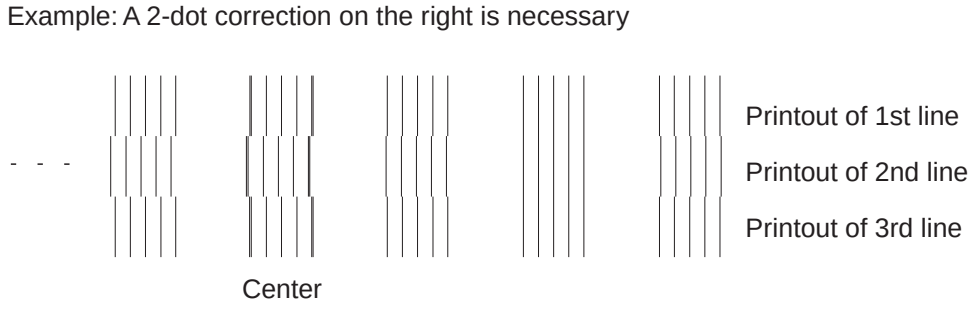
Example: A 2-dot correction on the right is necessary
Printout of 1st line
Printout of 2nd line
Printout of 3rd line
Center

Figure 3-6 Sample Test Pattern with Vertical Misalignment

NOTE

All registration defaults are 0.
SHQ2 mode is not used in this model.

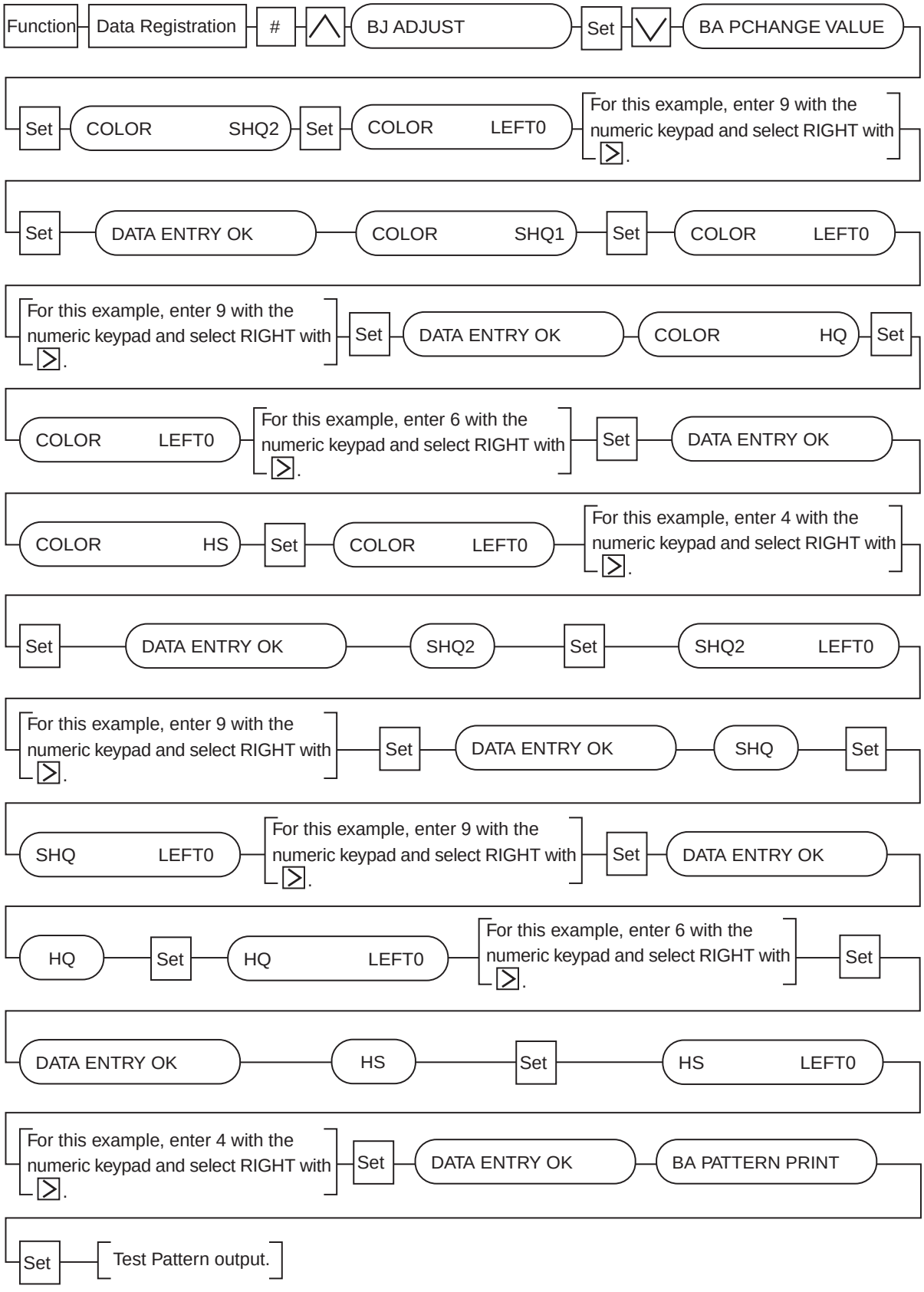

Figure 3-7 Vertical Line Misalignment Correction Procedure

4. TROUBLESHOOTING

4.1 Troubleshooting Index

For troubleshooting, use the troubleshooting index below to investigate the cause of the problem and refer to the specified page for countermeasures.

Problem

- **General errors** **Page 3-24.**
  - The unit does not power on. (Evaluation criteria: Look at the unit in question.)
  - The display looks abnormal. (Evaluation criteria: Check it with the operation panel test.)
  - The buttons do not work. (Evaluation criteria: Check it with the operation panel test.)
  - No sound from the speaker

- **Errors shown on the display (Evaluation criteria: Look at the unit in question.)**
  - The error message can be checked. **Page 3-11.**
  - The error code can be checked. **Page 3-16.**

- **Printing problem (Evaluation criteria: Test printing is no good.)**
  - The paper is not fed properly. **Page 3-25.**
    The paper feed motor does not run.
    The paper is not picked up from the auto sheet feeder.
  - The printing operation is abnormal. **Page 3-25.**
    Nothing is printed.
    The carriage motor does not run.
  - Printing quality error **Page 3-26.**
    (Evaluation criteria: Look at the printing result.)
    Print is not clear.
    Blurred or smudged characters.
    Smudges appear on back of printed page.
    Irregular print quality.
    Print head needs cleaning.
    Horizontal white stripes appear on some entirely black parts of the print.

- **Scanning problem (Evaluation criteria: Test printing is good, but the copied image is no good.)**
  - The document is not fed. **Page 3-27.**
    The document feed motor does not run.
    The document slips against the rollers.
    The document does not separate.
    Faulty scanner unit's sensors
  - The scanning image is abnormal. **Page 3-28.**
    Nothing is printed.
    The image has vertical stripes.
    The image has thick vertical stripes.
    The half-tone image contains black dots.
    The color or brightness of the scanned image is not normal.

4.2 Errors Shown on the Display

4.2.1 User error message

Look for the applicable error message and execute the appropriate countermeasures.

"BUSY/NO SIGNAL" (#005/#018)

Cause:	The receiving fax did not answer within 35 seconds. (T1 timer over)
Solution:	Contact the other party and have them check their fax.You can try to send the document manually. For an overseas call, add pauses to the registered number.
Cause:	The touch tone/rotary pulse setting on your fax is incorrect.
Solution:	Set your fax to the setting that matches your telephone line.
Cause:	The other party is not using a G3 machine.
Solution:	Contact the other party and have them send or receive the document using a G3 machine.
Cause:	The other party's fax is not working.
Solution:	Contact the other party and have them check their fax.
Cause:	The telephone number you dialed is busy.
Solution:	Try sending the document at a later time.

"BLACK INK EMPTY"

Cause:	The BCI-21 black BJ ink cartridge is empty or its ink may have dried out.
Solution:	(1) Replace the BCI-21 Black ink cartridge. (2) Clean the BJ cartridge print head. (3) Replace the BJ cartridge print head.

"CARTRIDGE JAMMED"

Printing position correction failed

Cause: Carriage movement prevented by one of the following.
Damaged shaft.
Parts deformed. (Carriage or guide frame)
Insufficient grease.

Countermeasure: Replace the shaft.
Replace the deformed parts.
Apply more grease.

Cause: Bi-directional print displacement correction failed because the carriage motor is out of step, or some similar reason.

Countermeasure: Replace the carriage motor.

Home position error

Cause: Foreign body in carriage section.

Countermeasure: Open printer cover, and remove foreign body.

Cause: Loose carriage belt.

Countermeasure: Replace carriage belt.

Cause: Guide frame home position detection tabs is damaged or bent parts.

Countermeasure: Replace the damaged or bent parts.

Cause: Carriage motor does not work.

Countermeasure: (1) Switch power OFF/ON.
(2) Replace carriage motor.

Cause: Carriage position cannot be detected. (Home position sensor breakdown, or BJ controller malfunction)

Countermeasure: (1) Switch power OFF/ON.
(2) Replace carriage cable with one that has a home position sensor attached.
(3) Replace the SPCNT board.

NOTE

This error message means the same as service error codes ##338 and ##340. When this error occurs in this model, it is not treated as a service error, but as a user error, and the error message is displayed.

"CHANGE CARTRIDGE" (#052)

Cause: The BJ cartridge has run out of ink.

Solution: Replace the BJ cartridge.

"CHECK DOCUMENT" (#001)

Cause : Document jam. This is displayed when the document sensor detects paper, but the document edge sensor cannot detect the leading edge of the document with 15 seconds from the start of the feed operation.

Solution: Clear the document jam.

"CHECK PAPER SIZE"

Cause: The size of the paper loaded in the paper cassette is different from the paper size set by user data.

Solution: Set the correct paper size in the PRINTER SETTING > PAPER SIZE.

"CHECK PRINTER" (##332~##337, ##345, ##346 and ##348)

Cause: The printer's internal unit has malfunctioned.

Solution: (1) Remove the jammed paper. (Check the paper end sensor is OFF.)
(2) Press **Resume** button.
(3) Reinstall the Cartridge.
(4) Turn the power off and on.
(5) Set the service data #1 SSSW SW01 bit 0 to "1" and check the service code. Refer to the countermeasures for that error code.

"CLEAR PAPER JAM" (#009)

Cause: Paper jam.

Solution: Clear the paper jam and press the **Resume** button.

"COLOR INK EMPTY"

Cause: The BCI-21 Color BJ ink cartridge is empty or its ink may have dried out.

Solution: (1) Replace the BCI-21 Color ink cartridge.
(2) Clean the BJ cartridge print head.
(3) Replace the BJ cartridge print head.

"CONVERT CLR>B&W?"

Cause: The unit is confirming that it is all right to print a color document in memory with a BC-20 Black BJ cartridge in black & white.

Solution: Press the * button to print the color document in black & white , or press the # button to cancel printing.

"DATA ERROR"

Cause: The registration data in the SRAM was destroyed and a checksum error occurred due to a dead lithium battery or SRAM failure.

Solutions: (1) Press the **Set** button, and turn the power off and on again.
(2) Replace the lithium battery.
(3) Replace the SPCNT board.

"DOC. TOO LONG" (#003)

Cause: The document is longer than 39.4"(1m).

Solution: Use a copy machine to make a reduced copy of the document. Then send again.

Cause: It took more than 32 minutes to send or copy a document. It took more than 32 minutes to receive a document.

Solution: Divide the document and send or copy each part separately. Contact the other party. Have them divide the document and send each part separately.

"HANG UP PHONE"

Cause: The handset or the extension telephone is off the hook.

Solution: Put the handset or the extension telephone back on the hook.

"INSTALL BC-21e"

Cause: You tried to make color copies with a BC-20 Black BJ cartridge installed.

Solution: Remove the BC-20 Black BJ cartridge and install the BC-21e Color or BC-22e Photo BJ cartridge.

Cause: You tried to print a received color fax with a BC-20 Black or BC-22e Photo BJ cartridge installed.

Solution: Remove the BC-20 Black BJ cartridge or BC-22e Photo BJ cartridge and install the BC-21e Color BJ cartridge. You can print the received color fax in memory with BC-20 or BC-22e by memory reference function.

"INSTALL BC21e/20"

Cause: You tried to make black copies with a BC-22e Photo BJ cartridge installed.

Solution: Remove the BC-22e Photo BJ cartridge and install the BC-20 Black or BC-21e Color BJ cartridge.

Cause: You tried to print a received black & white fax, print areport, or print a black & white document in memory with a BC-22e Photo BJ cartridge installed.

Solution: Remove the BC-22e Photo BJ cartridge and install the BC-20 Black or BC-21e Color BJ cartridge.

"LOAD PAPER" (#009)

Cause: The fax is out of paper.

Solution: Add more paper to the paper cassette. Make sure the stack is below the limit mark and press the **Start/Scan** or **Resume** button.

"MEMORY FULL" (#037)

Cause: The fax's memory is full because it has received too many documents.

Solutions: (1) Print out any documents which are stored in memory. Then start the operation again.
(2) If the memory contains any facsimiles you don't need, delete them.
(3) You cannot receive a fax was scanned with fine graphic images.

Cause: The fax's memory is full because you tried to send too many pages at once.

Solution: Divide the document and send each part separately.

"NO ANSWER" (#005)

Cause:	The receiving fax machine does not answer.
Solution:	Make sure you dialed the correct number. Try again later.

"NO RX PAPER" (#012)

Cause:	The receiving fax machine declares no paper in DIS, or its memory is full.
Solution:	Contact the other party, and ask them to put paper in their machine, or to clear their fax machine's memory.

"NO TEL #" (#022)

Cause:	The button you pressed has no number registered for One-Touch Speed Dialing, Coded Speed Dialing, or Group Dialing.
Solution:	Print a list of registered numbers and make any corrections needed, then try again.

"NOT AVAILABLE NOW"

Cause:	One-touch or coded speed dial already registered.
Solution:	Check the contents of the one-touch or coded speed dialling registration, then try again.

"PRINT W/ BC-22e?"

Cause:	The unit is confirming that it is all right to print a color document in memory with a BC-22e Photo BJ cartridge.
Solution:	Press the ✻ button to print the color document with a BC-22e Photo BJ cartridge, or press the # button to cancel printing.

"PUT IN CARTRIDGE"

Cause:	The BJ cartridge is not set.
Solution:	Set the BJ cartridge.
Cause:	The BJ cartridge is set incorrectly.
Solution:	Set the BJ cartridge correctly.

"START AGAIN"

Cause:	An error occurred on the phone line or in the system.
Solution:	Start the procedure again from the beginning.

"TRY AGAIN IN B/W" (#085)

Cause:	You tried faxing a color document to a machine that does not support color faxing.
Solution:	(1) Try sending again in black & white. (2) Check the received fax machine’s setting for color faxing is available.

"WAIT COOLING"

Cause:	The BJ cartridge is hot.
Solution:	Wait until the message disappears.

4.2.2 Error codes

a) Service error code output

When service data #1 SSSW SW01 bit 0 is set to "1", then service error codes are printed on the activity management reports, reception result reports and error transmission reports, when communication ends in an error. Also, the following is displayed, when an error occurs.

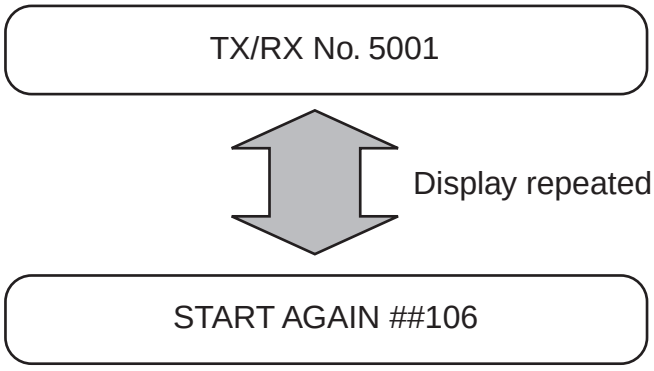

Figure 3-8 Service Error Code Display

b) Error code countermeasures

From item c), all the error codes which the unit can display are listed. The separate *G3 Facsimile Error Code List (Rev. 1)* does not specify the countermeasures for resolvable error codes. Also refer to this list when an error code appears.

The *G3 Facsimile Error Code List (Rev. 1)* does not specify countermeasures for all error codes. The countermeasures that are specified in the *G3 Facsimile Error Code List (Rev. 1)* are included here as specific countermeasures for your reference.

- **Increase the transmission level**

  Set service data #2 MENU Parameter No.07 to 0 (dBm).

- **Decrease the transmission level**

  Set service data #2 MENU Parameter No.07 to -15 (dBm).

- **Echo measures**

  Change the following bit switches of service data #1 SSSW SW03.

  Bit 4:1 Ignore the first DIS signal sent by the other fax machine.
  0 Do not ignore the first DIS signal sent by the other fax machine.
  Bit 5:1 Transmit a tonal signal (1850 or 1650 Hz) when the other fax machine sends a DIS signal.
  0 Do not transmit a tonal signal when the other fax machine sends a DIS signal.
  Bit 6:1 Transmit a 1850-Hz tonal signal when bit 5 is 1.
  0 Transmit a 1650-Hz tonal signal when bit 5 is 1.
  Bit 7:1 Transmit a tonal signal before sending a CED signal.
  0 Do not transmit a tonal signal before sending a CED signal.

- **EPT (Echo Protect Tone)**

  Change service data #1 SSSW SW03 bit 1.

  Bit 1:1 Transmit an echo protect tone.

  0 Not transmit an echo protect tone.

- **Adjust NL equalizer.**

  Set service data #2 MENU Parameter No.05 to "ON".

- **Reduce the transmission start speed.**

  Reduce the transmission speed by changing user data "SYSTEM SETTINGS" "TX START SPEED".

- **Loosen the TCF judgment standard.**

  Not available for this fax.

- **Loosen the RTN transmission conditions.**

  Change service data #3 NUMERIC Param. Parameter No.02 to 04.

  No.02 Percentage of errors in all lines : Set close to 99%.

  No.03 Number of lines of burst condition : Set close to 99 lines.

  No.04 Lines below the burst condition : Set close to 99 times.

- **Increase the no-sound time after CFR reception.**

  Change service data #1 SSSW SW04 bit 4 to "1".

  Bit 4:1 Time when the low-speed signal is ignored after sending a CFR signal: 1500 ms

  0 Time when the low-speed signal is ignored after sending a CFR signal: 700 ms

c) ERROR CORD LIST for MultiPASS C530/C560

New error codes indicate *"new"* in this list.

C-1) User error code

	No.	Tx or Rx	Definition
	#001	[TX]	Paper jam
	#003	[TX/RX]	Copy page, communication time over
	#005	[TX/RX]	Initial ID (T1) time over
	#009	[RX]	Recording paper jam or out of paper
	#011	[RX]	Polling error
	#012	[TX]	Other party out of paper
	#018	[TX/RX]	Automatic dialing error
	#021	[RX]	DCN during polling Rx
	#022	[TX]	Call failure
	#037	[RX]	Image memory full
	#039	[TX]	Closed network Tx failure
	#052	[RX]	Image memory full by no ink error
new	#085	[TX]	Other party does not support ITU-T Color Faxing
	#995	[TX/RX]	Memory Communication reservation cancellation

c-2) Service error code

• G3 mode error codes

No.	Tx or Rx	Definition
##100	[TX]	Excessive repeat protocol during Rx
##101	[TX/RX]	Modem speed different from other party
##102	[TX]	Fall back failure during Tx
##103	[RX]	Fail to detect EOL for 5 seconds (15 seconds for CBT) during Rx
##104	[TX]	RTN or PIN received during Tx
##106	[RX]	Fail to receive protocol for 6 seconds when waiting for protocol during Rx
##107	[RX]	Fall back failure on Tx side during Rx
##109	[TX]	Receive Signals other than DIS, DTC, FTT, CFR or CRP after DCS Tx and exceed the number of protocol re-transmissions during Tx
##111	[TX/RX]	Memory error
##114	[RX]	RTN Transmission during reception
##200	[RX]	Fail to detect picture Rx carrier for 5 seconds during Rx
##201	[TX/RX]	DCN received other than normal binary protocol
##204	[TX]	Receive DTC without Tx data
##220	[TX/RX]	System error (main program runaway)
##224	[TX/RX]	Abnormal protocol during G3 communication
##229	[RX]	Recording unit locked for 1 minute
##232	[TX]	ENCODE control unit malfunction
##237	[RX]	DECODE control unit malfunction
##238	[RX]	PRINT control unit malfunction
##261	[TX/RX]	System error between MODEM and SCNT
##280	[TX]	Excessive repeat protocol command during Tx
##281	[TX]	Excessive repeat protocol command during Tx
##282	[TX]	Excessive repeat protocol during Tx

No.	Tx or Rx	Definition
##283	[TX]	Excessive repeat protocol during Tx
##284	[TX]	DCN reception after TCF transmission
##285	[TX]	DCN reception after EOP transmission
##286	[TX]	DCN reception after EOM transmission
##287	[TX]	DCN reception after MPS transmission
##288	[TX]	Receive signals other than PIN, PIP, MCF, RTP or RTN after EOP transmission
##289	[TX]	Receive signals other than PIN, PIP, MCF, RTP or RTN after EOM transmission
##290	[TX]	Receive signals other than PIN, PIP, MCF, RTP or RTN after MPS transmission

• Printer error codes

No.	Tx or Rx	Definition
##332	[TX/RX]	Printer control DRAM check error
##333	[TX/RX]	Printer control ROM check error
##334	[TX/RX]	Printer control EEPROM check error
##335	[TX/RX]	Data transmission error between the system control section and printer control section
##336	[TX/RX]	BJ head abnormal temperature error
##337	[RX]	BJ head temperature sensor error
new ##342	[TX/RX]	Cleaning absorption waste ink capacity full
##345	[TX/RX]	BJ cartridge head cleaning error
##346	[TX/RX]	Inside temperature error
##348	[TX/RX]	Ink detection sensor error

• V.8/V.34 protocol error codes (MultiPASS C560 only)

No.	Tx or Rx	Definition
##670	[TX]	At V.8 late start, the called party declares the V.8 protocol in DIS signal and this unit transmits a CI signal, but the protocol does not progress and a T1 time-out occurs.
##671	[RX]	At V.8 termination, the protocol did not advance to phase 2 and a T1 time-out occurs after the caller CM signal was detected.
##672	[TX]	The protocol did not move from phase 2 to phase 3 and a T1 time-out occurred during V.34 transmission.
##673	[RX]	The protocol did not move from phase 2 to phase 3 and a T1 time-out occurred during V.34 reception.
##674	[TX]	The protocol did not move from phase 3 to phase 4 and a T1 time-out occurred during V.34 transmission.
##675	[RX]	The protocol did not move from phase 3 to phase 4 and a T1 time-out occurred during V.34 reception.

• ECM mode error codes

No.	Tx or Rx	Definition
##750	[TX]	Exceed repeat protocol due to failure to receive significant signals after transmitting PPS-NULL during ECM Tx
##752	[TX]	Receive DCN after PPS-NULL transmission during ECM Tx
##753	[TX]	Exceed protocol retransmission limit or T5 time (60 seconds) after PPS-NULL transmission during ECM Tx
##754	[TX]	Exceed retransmit protocol after PPS-NULL transmission during ECM Tx
##755	[TX]	Exceed protocol retransmission limit due to failure to receive significant signals after PPS-MPS transmission during ECM Tx during ECM Tx
##757	[TX]	Receive DCN after PPS-MPS Transmission during ECM Tx
##758	[TX]	Exceed Protocol Retransmission Limit or T5 Time (60 seconds) after PPS-MPS Transmission during ECM Tx
##759	[TX]	Exceed Retransmit Protocol after PPS-MPS Transmission during ECM Tx
##760	[TX]	Exceed Protocol Retransmission Limit Due to Failure to Receive Significant Signals after PPS-EOM Transmission during ECM Tx
##762	[TX]	Receive DCN after PPS-EOM Transmission during ECM Tx
##763	[TX]	Exceed Protocol Retransmission Limit or T5 Time (60 seconds) after PPS-MPS Transmission during ECM Tx
##764	[TX]	Exceed Retransmit Protocol after PPS-EOP Transmission during ECM Tx
##765	[TX]	Exceed protocol retransmission limit due to failure to receive significant signals after PPS-EOP transmission during ECM Tx
##767	[TX]	Receive DCN after PPS-EOP transmission during ECM Tx
##768	[TX]	Exceed protocol retransmission limit or T5 time (60 seconds) after PPS-EOP transmission during ECM Tx
##769	[TX]	Exceed retransmit protocol after PPS-EOP transmission during ECM Tx
##770	[TX]	Exceed repeat protocol limit due to failure to receive significant signals after transmitting EOR-NULL during ECM Tx
##772	[TX]	Receive DCN after EOR-NULL transmission during ECM Tx
##773	[TX]	Exceed protocol retransmission limit or T5 time (60 seconds) after EOR-NULL transmission during ECM Tx
##774	[TX]	Receive ERR after EOR-NULL transmission during ECM Tx
##775	[TX]	Exceed protocol retransmission limit due to failure to receive significant signals after EOR-MPS transmission during ECM Tx
##777	[TX]	Receive DCN after EOR-MPS transmission during ECM Tx
##778	[TX]	Exceed protocol retransmission limit or T5 time (60 seconds) after EOR-MPS transmission during ECM Tx
##779	[TX]	Receive ERR after EOR-MPS transmission during ECM Tx
##780	[TX]	Exceed protocol retransmission limit due to failure to receive significant signals after EOR-EOM transmission during ECM Tx.
##782	[TX]	Receive DCN after EOR-EOM transmission during ECM Tx

No.	Tx or Rx	Definition
##783	[TX]	Exceed protocol retransmission limit or T5 time (60 seconds) after EOR-EOM transmission during ECM Tx
##784	[TX]	Receive ERR after EOR-EOM transmission during ECM Tx
##785	[TX]	Exceed protocol retransmission limit due to failure to receive significant signals after EOR-EOP transmission during ECM Tx.
##787	[TX]	Receive DCN after EOR-EOP transmission during ECM Tx
##788	[TX]	Exceed protocol retransmission limit or T5 time (60 seconds) after EOR-EOP transmission during ECM Tx
##789	[TX]	Receive ERR after EOR-EOP transmission during ECM Tx
##790	[RX]	Transmit ERR after EOR-Q reception during ECM Rx
##791	[TX/RX]	Receive non-significant signals during ECM mode procedures
##792	[RX]	Fail to detect PPS-NULL between partial pages during ECM Rx
##793	[RX]	Time over due to failure to receive valid frame during high speed signal Rx upon ECM Rx
##794	[TX]	Receive all 0 PPR during ECM Tx
##795	[TX/RX]	Trouble in the decoding processing during communication
##799	[TX]	System error

d) Recovery methods for codes indicated as "New"

Note, however, the following supplementary information, as the machine requires different actions than the existing models to correct:

##085 Other party does not support ITU-T Color Faxing

Solution:
(1) Try sending again in black & white.
(2) Check the received fax machine's setting for color faxing is available.

##342 Cleaning absorption waste ink capacity full

Solution: Unlike errors that trigger the **"CHECK PRINTER"** message, This error is programmed so that it cannot be cleared using the **Resume** button. Replace the waste ink absorber as follows in the error occurs:

(1) Select 3. INK ABS CAPA under #7 PRINTER in service mode, and the counter to 0.
(2) Check to make sure that no image exist in memory; then, turn off the power, remove the appropriate parts, and replace the waste ink absorber.

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4.3 Errors not Shown on the Display

4.3.1 General errors

• The unit does not turn on. (Evaluation criteria: Look at the actual unit.)

(1) Check the power cord connection.
(2) Check the connection between the SPCNT board (J33) and power supply unit.
(3) Check the power supply unit's fuse (F1).
(4) Replace the power supply unit.

• The display looks abnormal. (Applicable test mode: Operation panel test)

Nothing is displayed.

(1) Check the connection between the Operation panel unit and SPCNT board (J9).
(2) Replace the Operation panel unit.
(3) Replace the SPCNT board.

Part of the LCD panel does not display anything.

(1) Check for LCD problems with the test mode.
(2) Check the connection between the Operation panel unit and SPCNT board (J9).
(3) Replace the Operation panel unit. (Faulty LCD)
(4) Replace the SPCNT board.

• The buttons do not work. (Applicable test mode: Operation panel test)

(1) If the test mode can be used, check for faulty buttons.
(2) Check the connection between the Operation panel unit and SPCNT board (J9).
(3) Replace the Operation panel unit.
(4) Replace the SPCNT board.

• No sound from the speaker

(1) Check the connection of the speaker and SPCNT board (J5).
(2) Replace the speaker.
(3) Replace the SPCNT board.

4.3.2 Printing problem

• Faulty printing (Evaluation criteria: Test print is no good.)

• The paper is not fed correctly. (Evaluation criteria: Look at the actual unit.)

The Paper feed motor does not run.

(1) Check the connection from the paper feed motor to the SPCNT board (J4).
(2) Check the paper feed motor's resistance. 47 Ω/1 phase is normal. (*Fig. 3-9*)
(3) Replace the paper feed motor.
(4) Replace the SPCNT board.

The paper is not picked up from the auto sheet feeder.

(1) Check parts in the paper feed motor drive switching mechanism for abnormalities.
(2) Make sure that the ASF gear is attached correctly.
(3) Replace pickup roller ass'y.
(4) Replace SPCNT board (Faulty PRS or PES).

• The printing operation is abnormal.

Nothing is printed.

(1) Remove the BJ-cartridge and re-install it.
(2) Execute cleaning five times, and try printing again.
(3) Replace the BJ cartridge.

The carriage motor does not run.

(1) Check the connection from the carriage motor to the SPCNT board (J2).
(2) Check the carriage motor's resistance. 8.9 Ω/1 phase is normal. (*Fig. 3-9*)
(3) Replace the carriage motor.
(4) Replace the SPCNT board.

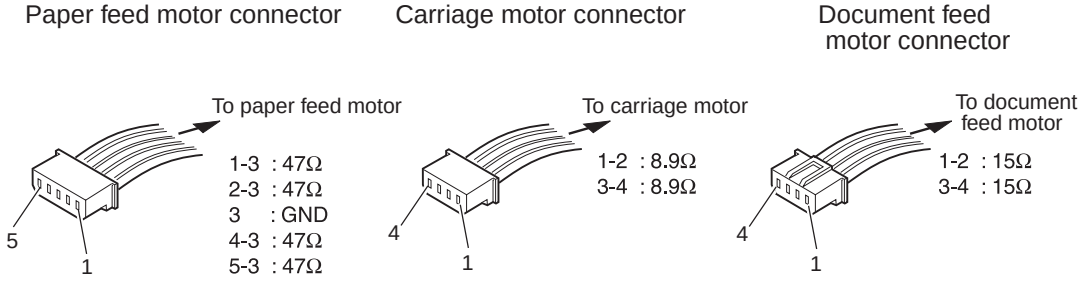


Figure 3-9 Paper Feed Motor/Carriage Motor/Document Feed Motor Connector

• Printing quality error (Evaluation criteria: Check the test print image's faults.)

• Print is not clear

(1) Paper has a correct side for printing. If the print quality is not as clear as you would like it to be, try turning the paper over and printing on the other side.

• Blurred or smudged characters

(1) If the printed characters are blurred or smudged, make sure you are using the recommended paper.

• Smudges appear on back of printed page

(1) If ink happens to get on the printer's platen, the back side of the printed page will have smudge marks. If this occurs, clean the platen by feeding a few sheets of paper through the printer.

• Irregular print quality

(1) If white streaks appear on the printed page or dots are missing in the printed output, clean the BJ head. The printer automatically cleans the BJ head when you follow these steps:
Press the **Function** button then press the **Cleaning** button and select **HEAD CLEANING** menu.

• Print head needs cleaning

(1) Paper dust or ink may get clogged in an ink nozzle in the BJ cartridge. Performing the BJ head cleaning procedure should clear up this problem.
The printer automatically cleans the BJ head when you follow these steps:
Press the **Function** button then press the **Cleaning** button and select **HEAD CLEANING** menu.

• Horizontal white stripes appear on some entirely black parts of the print

(1) Carry out nozzle cleaning on the BJ cartridge five times with the cleaning operation, then visually check the test print for non-discharge of ink from nozzles. (*Fig. 3-10*)
(2) Remove and reinstall the BJ cartridge.
(3) Replace the BJ cartridge.
(4) Check the connection of the carriage ribbon cable and the SPCNT board (J3).
(5) Replace the carriage ribbon cable.
(6) Replace the SPCNT board.

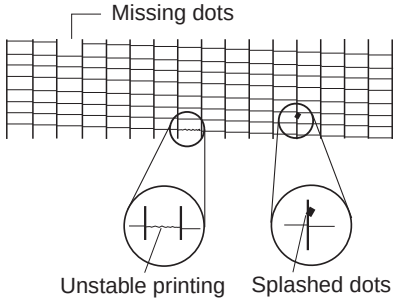


Figure 3-10 Defective Pattern (Sample)

4.3.3 Scanning problem

- **Faulty scanning (Evaluation criteria: Test print is good, but the copied image is no good.)**
  - **The document is not fed.**

The document feed motor does not run. (Evaluation criteria: Check it visually.)

(1) Check the connection from the document feed motor to the SPCNT board (J10).
(2) Check the document feed motor's resistance. 15 Ω/1 phase is normal. (*Fig. 3-9*)
(3) Replace the document feed motor.
(4) Replace the SPCNT board.

The document slips against the rollers. (Evaluation criteria: Check it visually. Stretched copy image.)

(1) See *page 3-4* and clean the document reading section.
(2) Replace the reading section's rollers.

The document does not separate. (Evaluation criteria: Check it visually.)

(1) Check whether the reading motor is driving all the rollers. (Check for any damaged gears or foreign matter stuck inside.)
(2) See *page 3-4* and clean the separation roller and separation guide.
(3) Replace the separation roller and separation guide.

Faulty scanner unit's sensors (Evaluation criteria: The placed document or transported document is not detected.)

(1) Check for any faulty sensors while executing the copying operation and test mode.
(2) Check the connection from operation panel unit to the SPCNT board (J9).
(3) Replace operation panel unit.
(4) Replace the SPCNT board.

- **The reading image is abnormal. (Evaluation criteria: Check the copy image's faults.)**
  Nothing is printed.
  (1) Check the connection between the contact sensor and SPCNT board (J31).
  (2) Clean the white sheet.
  (2) Replace the contact sensor assembly.
  (3) Replace the SPCNT board.

The image has vertical stripes.
(1) Clean the contact sensor's reading glass.
(2) Clean the white sheet.
(3) Check the connection between the contact sensor and SPCNT board (J31).
(4) Replace the contact sensor assembly.

The image has thick vertical stripes.
(1) Clean the contact sensor's reading glass.
(2) Clean the white sheet.
(3) Make sure the document is not slanted.
(4) Check the connection between the contact sensor and SPCNT board (J31).
(5) Replace the contact sensor assembly.

The halftone image contains black dots.
(1) Clean the contact sensor's reading glass.
(2) Clean the white sheet.
(3) Check the connection between the contact sensor and SPCNT board (J31).
(4) Adjust the CS LED lights-on duration. See *Page 3-6*.
(5) Replace the contact sensor assembly.
(6) Replace the SPCNT board.

The color or brightness of the image is not normal.
(1) Clean the contact sensor’s scanning glass.
(2) Clean the white sheet.
(3) Adjust the CS LED lights-on duration. See *Page 3-6*.
(4) Replace the contact sensor assembly.
(5) Replace the SPCNT board.

5. SERVICE SWITCHES

5.1 Hardware Switches

There is no service hardware switch on the Circuit board.

5.2 Service Data Setting

Service data can be checked and changed with items on display menus. The default values of the SSSW/ parameters available in this fax machine are shown in *this Chapter, 5.2.3 Service data setting* in this manual. The SSSW/parameters given in the previous product-specific manual are explained in the *G3 Facsimile Service Data Handbook*. The new switches for this model are described in *this Chapter, 5.2.3 Service data setting*.

5.2.1 Service data overview

The service data menu items are divided into the following nine blocks.

#1 SSSW (Service Soft Switch settings)

These setting items are for basic fax service functions such as error management, echo countermeasures, and communication trouble countermeasures.

#2 MENU (MENU switch settings)

These setting items are for functions required during installation, such as NL equalizer and transmission levels.

#3 NUMERIC Param. (NUMERIC parameter settings)

These setting items are for inputting numeric parameters such as the various conditions for the FAX/ TEL switching function.

#4 NCU (NCU settings)

These setting items are for telephone network control functions such as the selection signal transmission conditions and the detection conditions, for the control signals sent from the exchange.

#5 TYPE (TYPE setting)

The type setting makes the service data conform to a specific country communications standards. There is only one setting item in this block.

#6 GENESIS (UHQ function setting)

These setting items are for scanned image processing such as edge enhancement and error diffusion processing.

#7 PRINTER (PRINTER function settings)

These setting items are for basic printer service functions such as the reception picture reduction conditions. Also there is an item for resetting the printer section without switching the power off-on.

#8 CLEAR (data initialization mode)

Various data are initialized by selecting one of these setting items. There is a setting item for checking/inputting the total number of pages printed and total number of pages scanned by this fax.

#9 ROM (ROM management)

ROM data such as the version number and checksum are displayed.

5.2.2 Service data registration/setting method

Service data can be registered/set by the following operations:

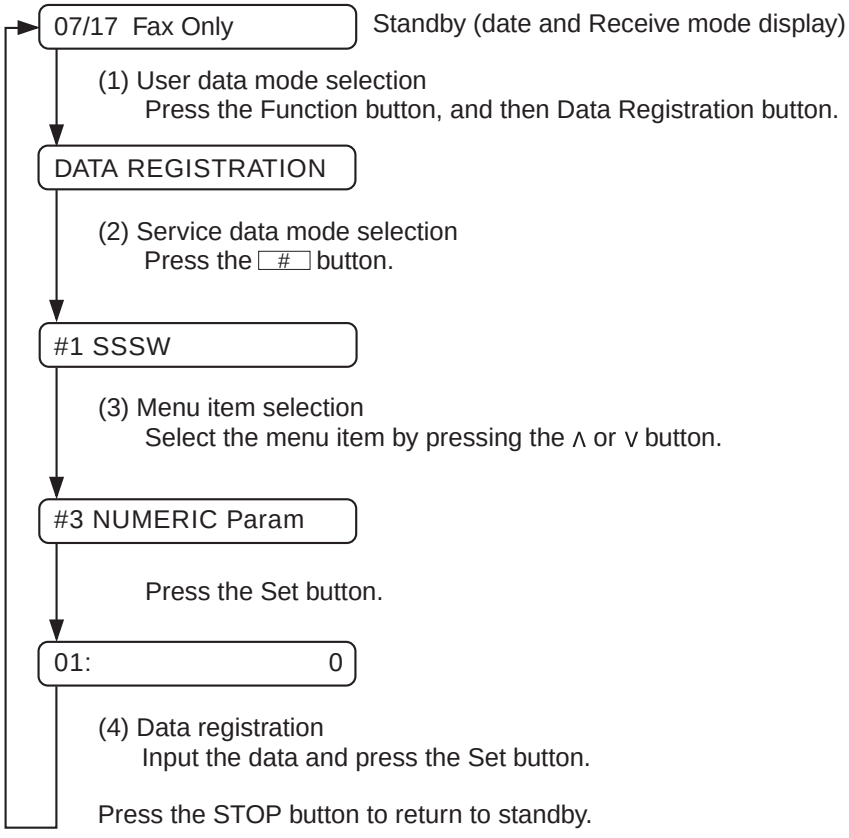

07/17 Fax Only
Standby (date and Receive mode display)
(1) User data mode selection
Press the Function button, and then Data Registration button.
DATA REGISTRATION
(2) Service data mode selection
Press the # button.
#1 SSSW
(3) Menu item selection
Select the menu item by pressing the ∧ or ∨ button.
#3 NUMERIC Param
Press the Set button.
01: 0
(4) Data registration
Input the data and press the Set button.
Press the STOP button to return to standby.

Figure 3-11 Service Data Setting Method

Precautions when registering/setting service data

Detach the telephone line before registering service data. We cannot guarantee the integrity of any reception of transmission operations during the registration process.

5.2.3 Service data setting

Service data

04 ⟷ 06

#1 SSSW
(Service soft switch setting)

02 ↕ 08

Bit	7	6	5	4	3	2	1	0	
SW01	0	–	–	0	0	–	0	0	Error management
SW02	–	–	–	–	–	–	–	–	Not used
SW03	0	0	0	0	–	–	0	–	Echo solution setting
SW04	1	0	–	0	0	0	–	–	Communication trouble solution settings
SW05	–	–	–	0	0	–	–	–	Standard function (DIS signal) setting
SW06	–	–	–	1	–	0	–	–	Scan condition settings
SW07	–	–	–	–	–	–	–	–	Not used
SW08	–	–	–	–	–	–	–	–	Not used
SW09	–	–	–	–	–	0	0	0	Communications result display function settings
SW10	–	–	–	–	–	–	–	–	Not used
SW11	–	–	–	–	–	–	–	–	Not used
SW12	0	–	0	0	0	0	1	0	Page timer settings
SW13	–	–	–	–	–	–	–	–	Not used
SW14	–	–	–	–	–	–	–	–	Not used
SW15	–	–	–	–	–	–	–	–	Not used
SW16	–	–	–	–	–	–	–	–	Not used
SW17	–	–	–	–	–	–	–	–	Not used
SW18	–	–	–	–	–	–	–	–	Not used
SW19	–	–	–	–	–	–	–	–	Not used
SW20	–	–	–	–	–	–	–	–	Not used
SW21	–	–	–	–	–	–	–	–	Not used
SW22	–	–	–	–	–	–	–	–	Not used
SW23	–	–	–	–	–	–	–	–	Not used
SW24	–	–	–	–	–	–	–	–	Not used
SW25	–	–	–	–	–	–	0	0	Report display function settings
SW26	0	0	–	–	0	–	–	0	Transmission function settings
SW27	–	–	–	–	–	–	–	–	Not used
SW28	–	–	0	0	0	0	0	0	V.8/V.34 protocol settings (MuitiPASS C560 only)
SW29	–	–	–	–	–	–	–	–	Not used
SW30	–	–	–	–	–	–	–	–	Not used

Figure 3-12 Service Data (page 1)

The switches marked "–" are not used. Do not change their settings.

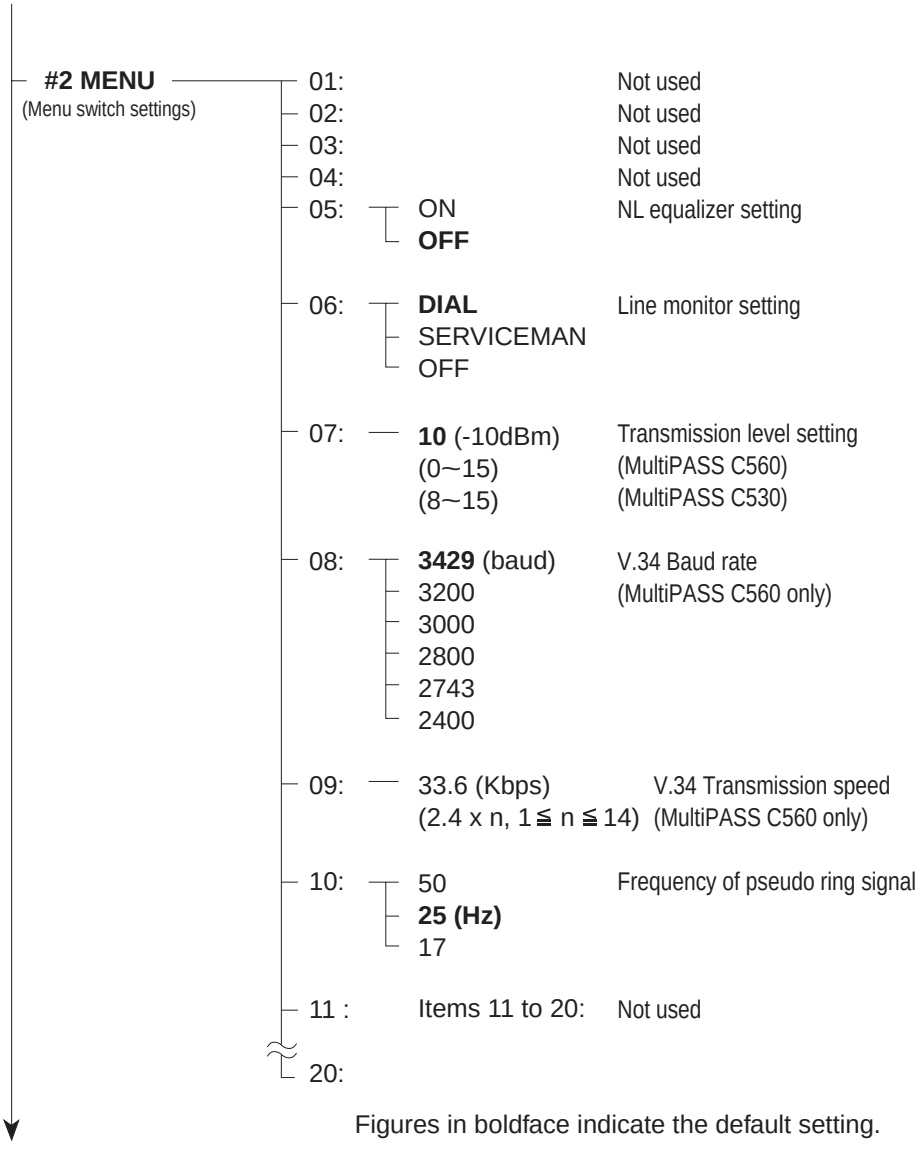


Figure 3-13 Service Data (page 2)

No. 01 to 04, 11 to 20 are not used. Do not change their settings.

#3 NUMERIC Param.
(Numeric parameter settings)

	Default	Range	
01:	0		Not used
02:	10 (10%)	(1~99)	RTN signal transmission condition (1)
03:	15 (15 lines)	(2~99)	RTN signal transmission condition (2)
04:	12 (12 times)	(1~99)	RTN signal transmission condition (3)
05:	4		Not used
06:	4		Not used
07:	0		Not used
08:	0		Not used
09:	6 (6 digits)	(1~20)	The number of digits in telephone number compared against TSI signal to be matched for restricted receiving function
10:	5500 (55 seconds)	(0~9999)	Line connection detection time (T0 timer)
11:	3500 (35 seconds)	(0~9999)	T1 Timer (Rx)
12:	0		Not used
13:	1320 (13 seconds)	(0~9999)	Maximum time to receive oneline of image data
14:	0		Not used
15:	120 (1200 ms)	(0~999)	Hooking detection time
16:	4 (4 seconds)	(0~9)	Pseudo RBT transmission from CML on time until start
17:	100 (1000 ms)	(0~999)	Pseudo RBT signal pattern: On time
18:	0 (0 ms)	(0~999)	Pseudo RBT signal pattern: Off time (short)
19:	200 (2000 ms)	(0~999)	Pseudo RBT signal pattern: Off time (long)
20:	100 (1000 ms)	(0~999)	Pseudo ring pattern: On time setting
21:	0 (0ms)	(0~999)	Pseudo ring pattern: Off time (short)
22:	200 (2000 ms)	(0~999)	Pseudo ring pattern: Off time (long)
23:	8 (MultiPASS C530) 44(MultiPASS C560)	(0~9) (Do not change)	FAX/TEL switching function (MultiPASS C530 only) signal detection level
24:	20	(0~20)	Pseudo-RBT signal transmission level
25:	60 (600 ms)	(0~999)	Answering machine connection function signal detection time
26:	4 (MultiPASS C530) 44(MultiPASS C560)	(0~9) (Do not change)	Answering machine connection function (MultiPASS C530 only) no sound detection level
27:	0		Not used
28:	0		Not used
29:	0		Not used
30:	0		Not used

Figure 3-14 Service Data (page 3)

No. 01, 05 to 08, 12, 14, and 27 to 30 are not used. Do not change their settings.

NOTE

#3 NUMERIC PARAM. (Numeric parameter settings)

The relationship between the settings and the detection levels is as follows:

Parameter 23 (MultiPASS C530 only)

0: -29 dBm	1: -33 dBm	2: -35 dBm	3: -38 dBm	4: -41 dBm
5: -44 dBm	6: -46 dBm	7: -47 dBm	8: -50 dBm	9: -50 dBm

Parameter 24

0: Not used	1: Not used	2: Not used	3: Not used	4: Not used
5: -8 dBm	6: -9 dBm	7: -10 dBm	8: -11 dBm	9: -12 dBm
10: -13 dBm	11: -14 dBm	12: -15 dBm	13: -16 dBm	14: -17 dBm
15: -18 dBm	16: -19 dBm	17: -20 dBm	18: -21 dBm	19: -22 dBm
20: -23 dBm				

Parameter 26 (MultiPASS C530 only)

0: -30 dBm	1: -34.5 dBm	2: -36.5 dBm	3: -40 dBm	4: -42 dBm
5: -46 dBm	6: -48 dBm	7: -50 dBm	8: -51 dBm	9: -54 dBm

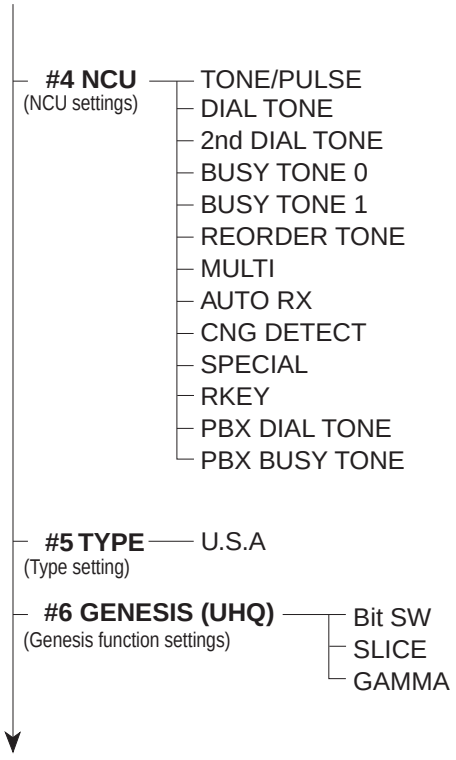


Figure 3-15 Service Data (page 4)

#4 NCU (NCU settings)

The values of these items are all set to match a specific nation's communications standards by the #5 TYPE setting. Do not change these setting.

#6 GENESIS (UHQ function settings)

Tampering with this setting may cause the scanned image quality to deteriorate. Do not change these settings.

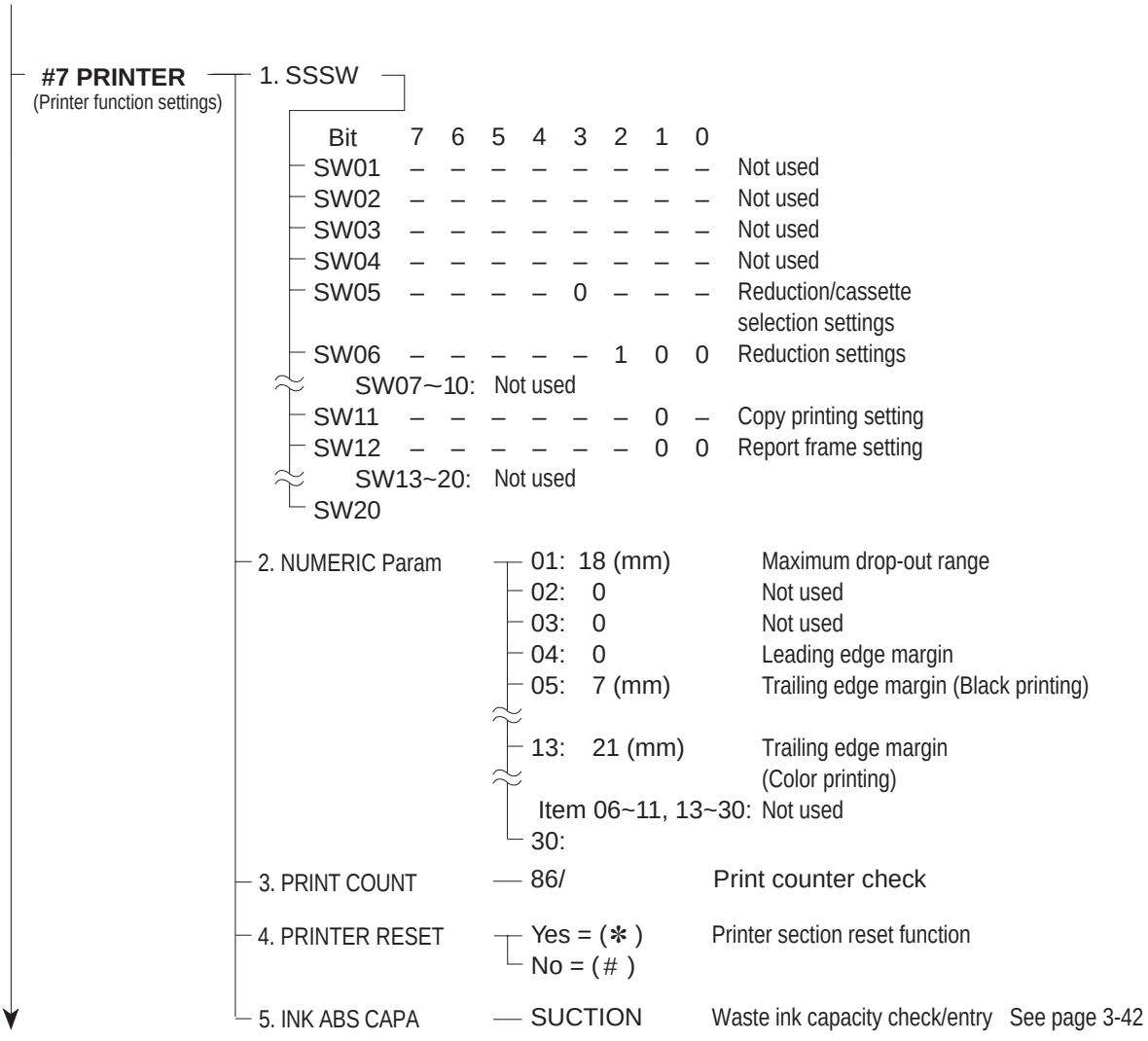

#7 PRINTER
(Printer function settings)
1. SSSW
Bit 7 6 5 4 3 2 1 0
SW01 – – – – – – – – Not used
SW02 – – – – – – – – Not used
SW03 – – – – – – – – Not used
SW04 – – – – – – – – Not used
SW05 – – – – 0 – – – Reduction/cassette selection settings
SW06 – – – – – 1 0 0 Reduction settings
SW07~10: Not used
SW11 – – – – – – 0 – Copy printing setting
SW12 – – – – – – 0 0 Report frame setting
SW13~20: Not used
SW20
2. NUMERIC Param
01: 18 (mm) Maximum drop-out range
02: 0 Not used
03: 0 Not used
04: 0 Leading edge margin
05: 7 (mm) Trailing edge margin (Black printing)
13: 21 (mm) Trailing edge margin (Color printing)
Item 06~11, 13~30: Not used
30:
3. PRINT COUNT
86/ Print counter check
4. PRINTER RESET
Yes = (✻)
No = (#)
Printer section reset function
5. INK ABS CAPA
SUCTION
Waste ink capacity check/entry
See page 3-42

Figure 3-16 Service Data (page 5)

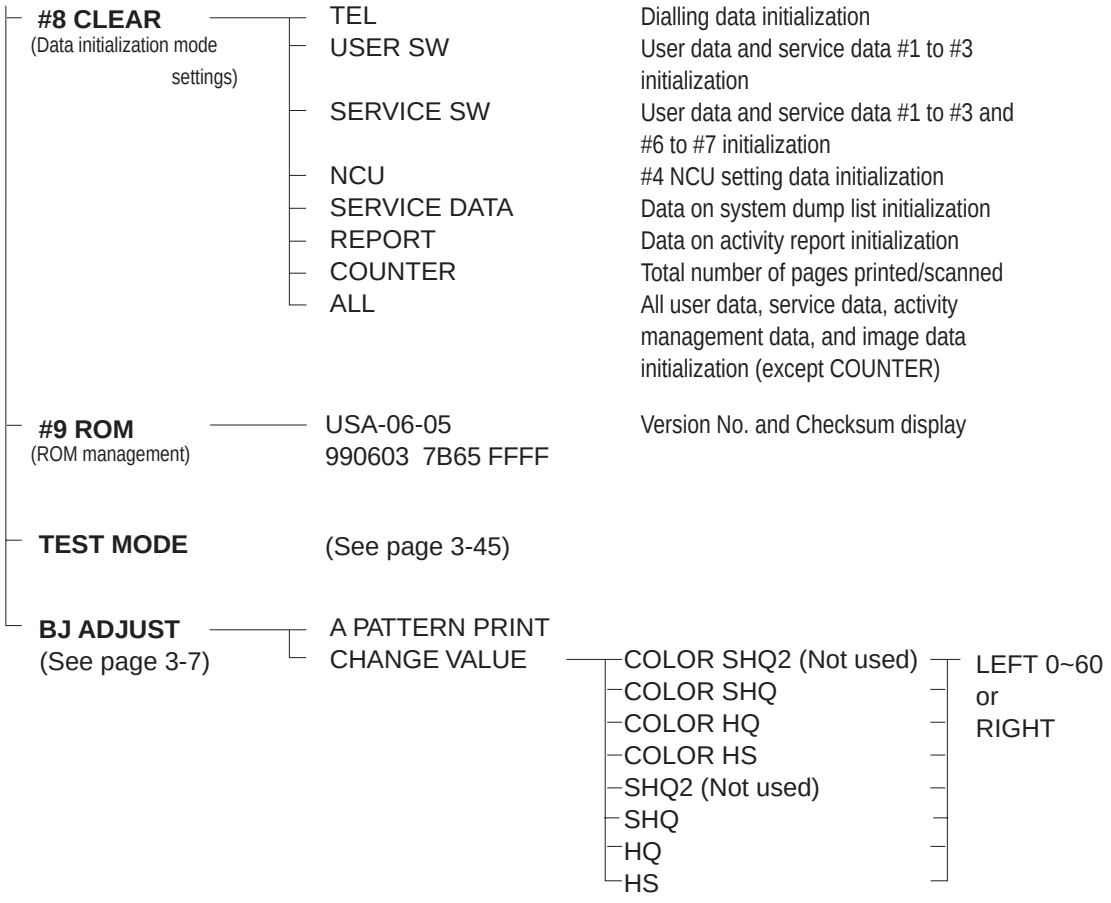
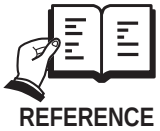


Figure 3-17 Service Data (page 6)

NOTE

If USER SW is selected from #8 CLEAR, the memory management of the user data is not cleared. If TEL or SERVICE SW is selected, the memory management of the user data is cleared.



REFERENCE

For details on test mode, see *6.2 Service Test Functions on page 3-44*.

5.2.4 Explanation of service data

a) SSSW (Service Soft Switch settings)

The items registered and set by each of these switches comprise 8-bit switches. The figure below shows which numbers are assigned to which bits. Each bit has a value of either 0 or 1.

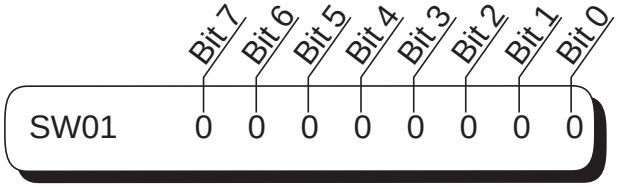
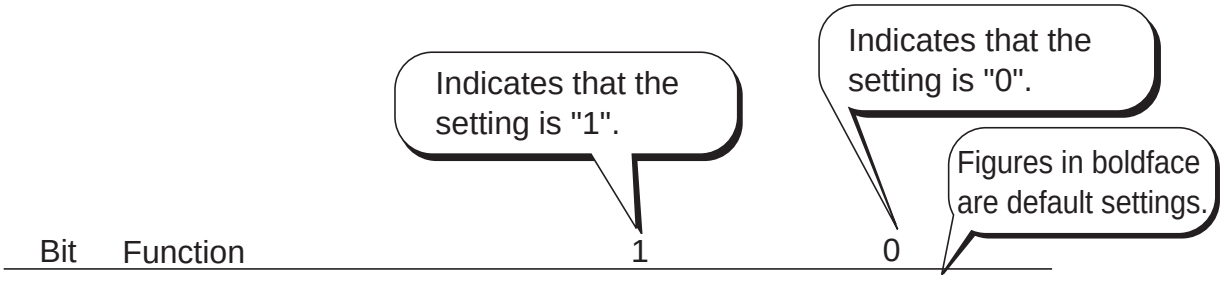


Figure 3-18 Bit Switch Display

See the chart in the service data shown in *this Chapter, 5.2.3 Service data setting* to see effective bits and their default values. The meanings (functions) of the bits are not described in this manual except the new switches added to this model. See *the G3 Facsimile Service Data Handbook (supplied separately)* for details of the switches.
Below are examples showing how to read bit switch tables.



Bit	Function	1	0
0	Service error code	Output	**Not Output**
1	Error dump list	Output	**Not Output**
2	Not used		
3	Copy function	No	**Yes**
4	##300 series service error code	Output	**Not Output**
5	Not used		
6	Not used		
7	User setting restriction	Setting possible	**Setting restricted**

Figure 3-19 How to Read Bit Switch Tables

5.2.5 New SSSWs/parameters added to this model

#1 SSSW (service soft switch setting)

SW01 (service soft switch 01: error management)

Bit	Function	1	0
0	Service error code	Output	**Not output**
1	Error dump list	Output	**Not output**
2	Not used		
3	Copy function	No	**Yes**
4 (New)	##300 series service error code	Output	**Not output**
5	Not used		
6	Not used		
7	User setting restriction	**Setting possible**	**Setting restricted**

[Bit 4]

Even when Bit0 is set to "Not output", you can select whether or not to output ##300 series Service Error Codes, caused by hardware malfunction.

When "Output" is selected, ##300 series Service Error Codes are displayed and in reports.

When "Not Output" is selected, no Service Error Codes are displayed.

SW28 (service soft switch 28: V.8/ V.34 protocol settings)

Bit	Function	1	0
0 (New)	Caller V.8 protocol	NO	**YES**
1 (New)	Called party V.8 protocol	NO	**YES**
2 (New)	Caller V.8 protocol late start	NO	**YES**
3 (New)	Called party V.8 protocol late start	NO	**YES**
4 (New)	V.34 reception fallback	Prohibited	**Not prohibited**
5	Not used		
6	Not used		
7	Not used		

[Bit 0]

Select whether to use the V.8 protocol when calling. If NO is selected, the V.8 protocol is inhibited at calling and the V.21 protocol is used.

[Bit 1]

Select whether to use the V.8 protocol when called. If NO is selected, the V8 protocol is inhibited when called and the V.21 protocol is used.

[Bit 2]

If ANSam signal is not received during transmission (mainly manual transmission), select whether to use the V.8 protocol when the other fax machine declares the V.8 protocol in DIS signal. If NO is selected, the CI signal is not transmitted and the V.8 protocol is not used even if the DIS that specifies the V.8 protocol is received.

[Bit 3]

Select whether to declare the V.8 protocol in DIS signal for reception (mainly caller manual transmission). If NO is selected, the V.8 protocol cannot be used because it is not declared in DIS signal.

[Bit 4]

Select whether the receiver falls back during V.34 reception. If OFF is selected, the receiver does not fall back.

#2 MENU

No.	Function	Selection range	Default setting
08	V.34 max. baud rate	2400~3429	3429 (3429 baud)
09	V.34 max. transmission speed	2400~33600	33600 (33600 bps)

[No. 08]

Select the maximum baud rate for V.34 transmission: 3429, 3200, 3000, 2800, 2743, and 2400.

[No.09]

Select the maximum transmission speed for V.34 transmission: 2400 to 33600 bps ($2400 \times n$: $1 \leq n \leq 14$).

#3 NUMERIC PARAM (numeric parameter settings)

No.	Function	Selecting range	Default setting
10	T0 Timer	0~9999	5500 (55 second)
11	T1 Timer (Rx)	0~9999	3500 (35 second)
13	Maximum time to receive one line of image data	500~3000	1300 (13 second)

[Parameter 10]

The "wait time after transmission of a dialing signal ends until a significant signal is detected in transmission" was set as T1 timer with parameter 10.

However, ITU-T recommends that it should be set as T0 timer, so parameter 10 has been renamed to T0 timer and the default time-out time has been changed from 35 to 55 seconds.

NOTE

The T1 timer for the transmitter (wait time after a CED, V21 flag, or ANSam significant signal is detected until the next significant signal is detected) is fixed at 35 seconds.

[Parameter 11]

Set the T1 timer for the receiver (wait time after DIS transmission starts until a significant signal is received).

If frequent errors occur during reception (2 instances) because of line connection conditions, raise the value of this parameter.

[Parameter 13]

Set the maximum time to receive one line of image data when image data is received.

If the other party is a computer fax and the time to receive one line of image data is long, raise the value of this parameter to increase the maximum reception (2 instances) time.

#7 PRINTER (printer function settings)

1. SSSW

SW12 (Switch 12: Report frame setting)

Bit	Function	1	0
0	Report frame lines	OFF	**ON**
1	Report frame line types	Dashed line	**Solid line**
2	Not used		
3	Not used		
4	Not used		
5	Not used		
6	Not used		
7	Not used		

[Bit 0]

Select whether to draw a frame for printing a report or list.

[Bit 1]

If a frame is drawn for printing a report or list, either a solid line or a dashed line can be selected.

#7 PRINTER (printer function settings)

2. NUMERIC PARAM.

No.	Function	Selecting range	Default setting
05	Trailing edge margin for black&white copy & FAX	0 ~ 9999	7 (7 mm)
13	Trailing edge margin for color copy & color FAX	0 ~ 9999	21 (21 mm)

[Parameter 07]

Sets the bottom margin for B/W printing (Copy & Fax). This parameter also sets the margins when PRINT AGAIN in user data is set to SMALLER for color printing.

[Parameter 13]

Sets the bottom margin for color printing. The margin used when PRINT AGAIN in user data is set to NORMAL can be changed by this parameter when color printing. However, when the trailing edge of the recording paper passes through the pinch roller when the margins have been narrowed, there are cases where a small amount of color shift occurs at the bottom edge of the image.

3. INK ABSORBER CAPA

This switch allows the waste ink capacity stored in the SPCNT board to be checked or entered.

[SUCTION]

This allows the waste ink capacity for the ink absorbed during cleaning to be checked or entered. When entering the waste ink capacity, use the numeric buttons to enter a value 0 to 100 (%).

NOTE

The ink absorber's absorption capacity for the waste ink discharged by the BJ cartridge is set to a certain amount. The waste ink capacity settings are stored in the SPCNT board's EEPROM. When replacing the SPCNT board, check the waste ink capacity and enter the waste ink capacity into the new SPCNT board.

The various waste ink capacity can be checked with the SYSTEM DUMP LIST.

6. TEST FUNCTIONS

6.1 User Test Print Functions

User enabled Test print functions are as follow.

6.1.1 Nozzle check

Execute cleaning if this test printing shows each nozzle condition such as no ejection, unclear or unstable etc. If the printing does not improve even after the cartridge is cleaned five times, replace the BJ cartridge or the ink cartridge. Press the **Function** button then press the **Cleaning** button, and select **"NOZZLE CHECK"** by the **Set** button.

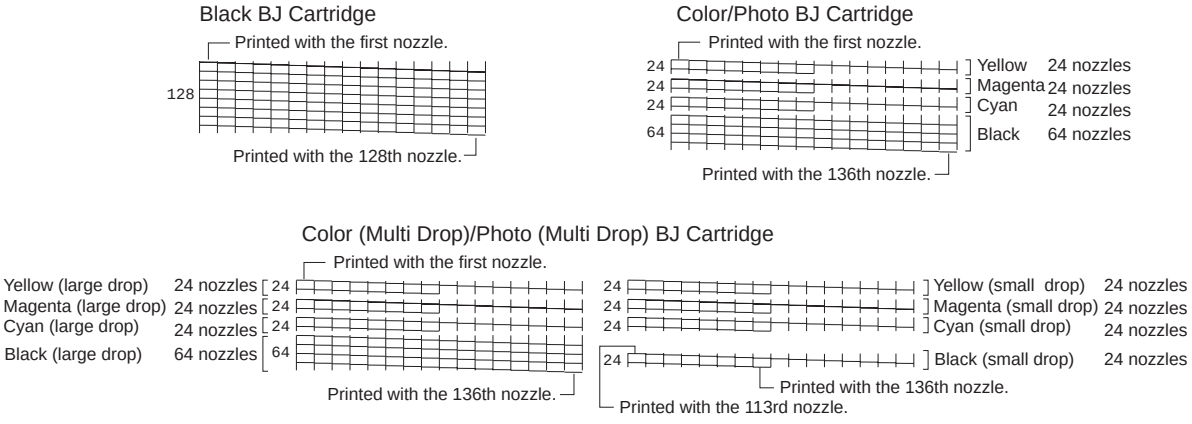


Figure 3-20 Nozzle Check Pattern

6.2 Service Test Functions

The fax functions for testing individual operations, such as below.
See *Page 3-45* for details of entering the test mode. To leave the test mode, press the **Function** button, and then **Clear** button.

6.2.1 Test mode overview

Test mode can be executed by following the menu items from the display.

a) DRAM tests

Writes data to DRAM image storage areas and reads that data to check operations.

b) CS test

CS test is used to enter the contact sensor's shading data.

c) Print test

Prints nine different patterns within the print area.

d) Modem, NCU tests

The frequency test and the G3 signal transmission and CNG signal and DTMF signals reception tests.

e) Faculty tests

Test the operation of operation panel and sensor functions.

f) Printer test

Test the operation of the printer functions.

6.2.2 Test mode flowchart

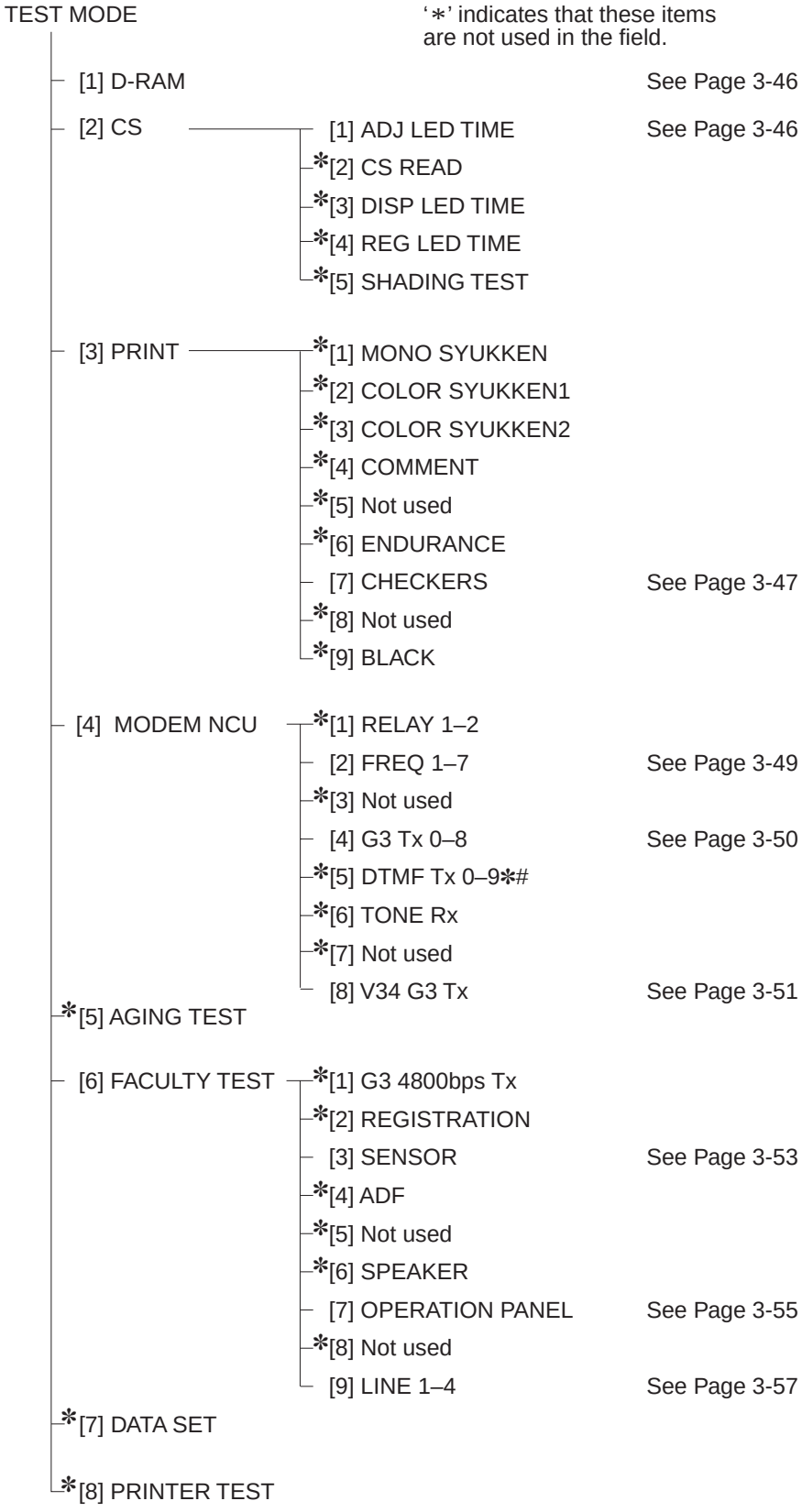


Figure 3-21 Test Mode

6.2.3 D-RAM tests

Pressing the *1* button from the test mode menu selects the D-RAM tests. D-RAM Test 1 writes data to the entire D-RAM region and reads it out to check that operations are correct. D-RAM Test 2 just reads data at high speed.

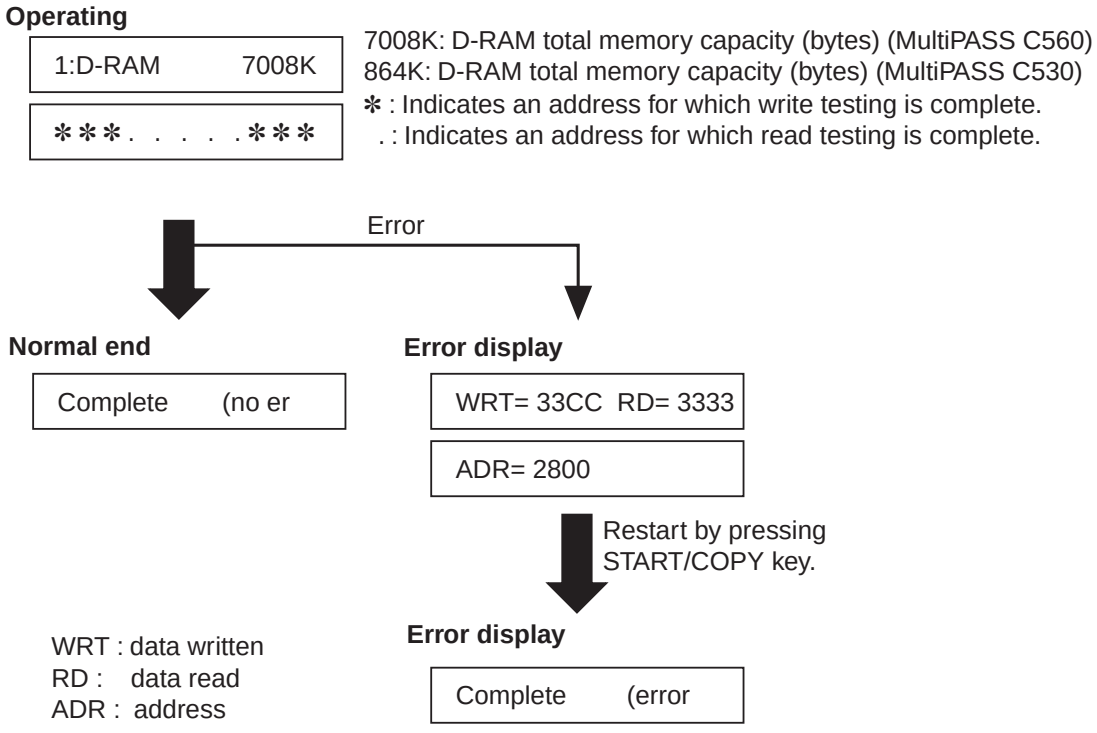
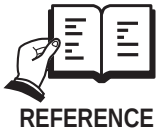

Operating
1:D-RAM 7008K
✻✻✻. . . . .✻✻✻
7008K: D-RAM total memory capacity (bytes) (MultiPASS C560)
864K: D-RAM total memory capacity (bytes) (MultiPASS C530)
✻ : Indicates an address for which write testing is complete.
. : Indicates an address for which read testing is complete.
Error
Normal end
Complete (no er
Error display
WRT= 33CC RD= 3333
ADR= 2800
Restart by pressing
START/COPY key.
Error display
Complete (error
WRT : data written
RD : data read
ADR : address

Figure 3-22 D-RAM Test

6.2.4 CS tests

Pressing the *2* button from the test mode menu selects the CS tests. **ADJ LED TIME** is used to adjust the CS LED lights-on duration and enter the contact sensor's shading data (pre-scan operation).



Details on CS LED lights-on duration adjustment, see *3.1 CS LED lights-on duration adjustment on page 3-6*.
Tests [2], [3], [4] and Tests [5] are not used in the field.

6.2.5 PRINT test

Pressing the **3** button from the test mode menu selects the print test. This test prints various patterns. For servicing, use the 3-7: CHECKERS pattern (press the **7** button from the print test menu). The other patterns are not to be used since they are for development and factory personnel. End this test by pressing the **Stop** button.

Check the pattern for the following:

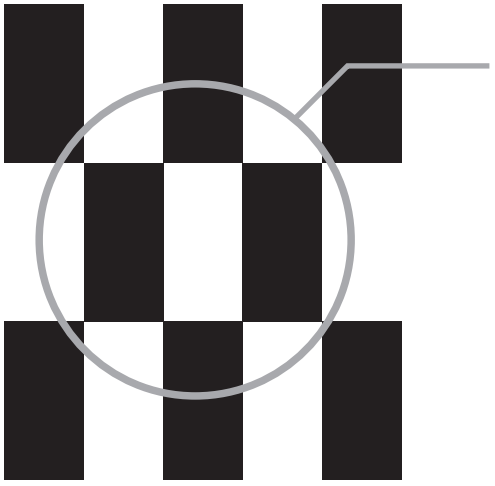

Check for any vertical or horizontal white stripes on the black squares.
Also, check that all the squares have straight edges on all four sides.

Figure 3-23 Print Test Pattern Check

NOTE

If the print test is normal, make a copy of a document. If the copy is faulty, the reading section is faulty.

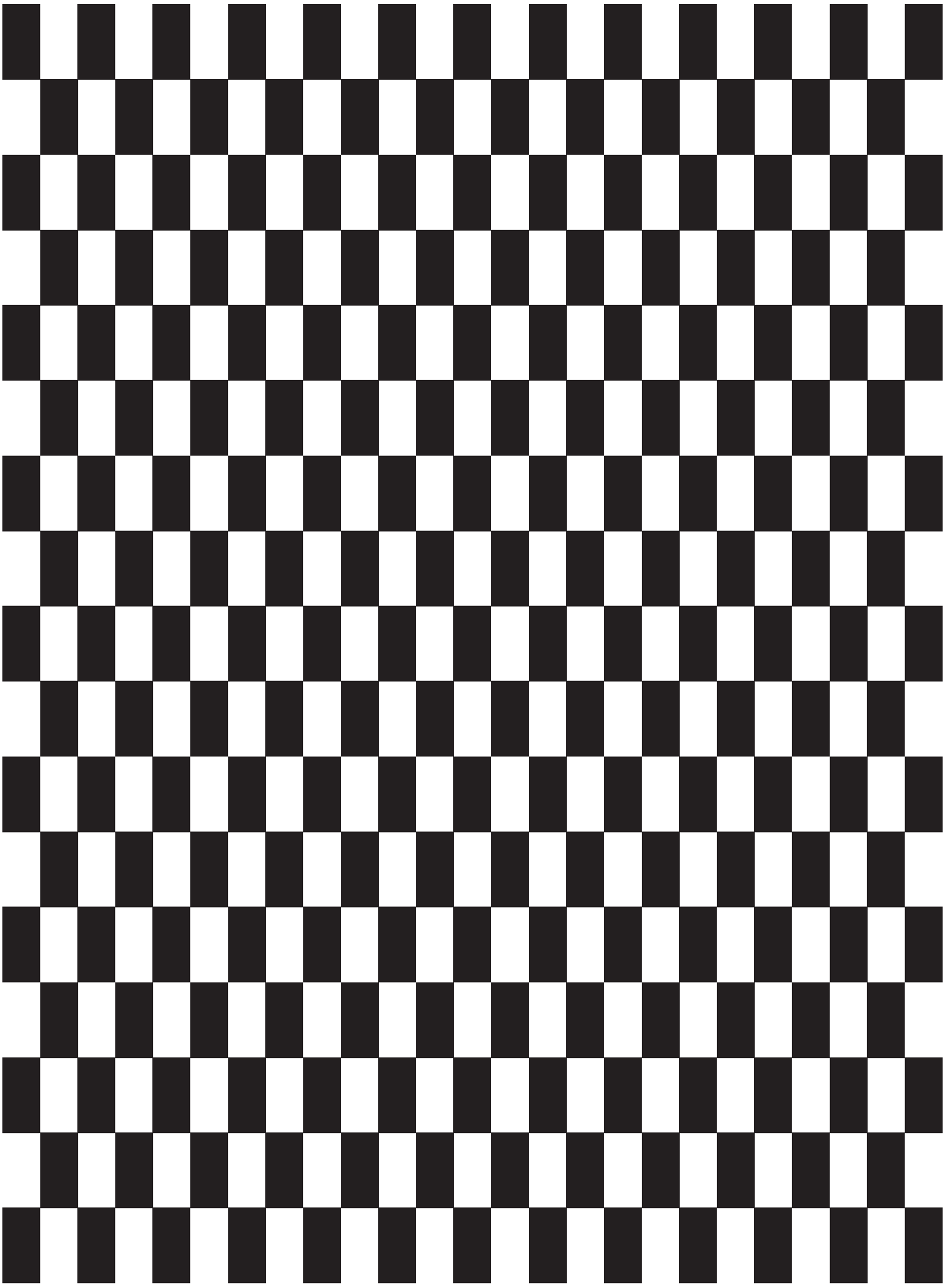


Figure 3-24 Print Pattern Sample

6.2.6 Modem and NCU tests

These tests test modem and NCU transmission and reception. The modem tests check whether signals are sent correctly from the modem by comparing the sound of the signals from the speaker with the sounds from a normal modem. Also, you check on the display whether or not the modem correctly detected received tone signals and DTMF signals.
End this test by pressing the **STOP** button.

Modem test type	Overview
Frequency test	The modem sends tone signals from the modular jack and the speaker.
G3 signal transmission test	The modem sends G3 signals from the modular jack and the speaker.
V34 signal transmission test	The V.34 modem sends G3 signals from the modular jack and the speaker

a) Frequency test

The frequency test menu is selected by pressing the *2* button from the MODEM NCU test menu. Signals of the frequencies below are sent from the modem using the modular jack and the speaker. The frequency can be changed with the numeric buttons.

Numeric button	Frequency
1	462 Hz
2	1100 Hz
3	1300 Hz
4	1500 Hz
5	1650 Hz
6	1850 Hz
7	2100 Hz

NOTE

The transmission levels for each frequency follow the service data transmission level settings.

b) G3 signal transmission test

The G3 signal transmission test menu is selected by pressing the **4** button from the MODEM NCU test menu. The G3 signals below are sent from the modem using the modular jack and the speaker. The frequency can be changed with the numeric buttons.

Numeric button	Frequency
0	300 bps
1	2400 bps
2	4800 bps
3	7200 bps
4	9600 bps
5	TC7200 bps
6	TC9600 bps
7	12000 bps
8	14400 bps

NOTE

The transmission level for each frequency follows the service data.

c) V.34 G3 signal transmission test (MultiPASS C560 only)

The V.34 G3 signal transmision test menu is selected by pressing the 8 key from the MODEM NCU test menu. The V.34 G3 signals below are sent from the modem using the modular jack and the speaker by pressing the start key.

The Baud rate can be changed with the numeric keys, and the Speed can be changed with the search keys.

Numeric key	Baud rate
0	3429 baud
1	3200 baud
2	3000 baud
3	2800 baud
4	2743 baud (Not used)
5	2400 baud

Search key	Speed
	2400 bps
	4800 bps
	7200 bps
Λ	9600 bps
	12000 bps
	14400 bps
	16800 bps
	19200 bps
	21600 bps
	24000 bps
V	26400 bps
	28800 bps
	31200 bps
	33600 bps

NOTE

The transmission level for each frequency follows the service data.

This page intentionally left blank.

6.2.7 Faculty tests

The faculty tests are selected by pressing the **6** button from the test mode menu. These tests test the following faculties of this fax.

Test type	Overview
Sensor tests	Test whether the sensors are operating correctly.
Operation panel test	Tests whether the button switches on the control panel are operating correctly.
Line signal reception test	Tests whether the NCU board signal sensor and frequency counter are operating correctly.

a) Sensor tests

The sensor test is selected by pressing the **3** button from the faculty test menu. In this test, you can check the status of each sensor of this fax in item 1 on the display.

You can also check if sensors that use actuators and microswitches are operating correctly by moving the actuator or microswitch.

NOTE

The sensor tests cannot be used to test all of the sensors. The following sensors cannot be tested with the sensor tests:

Home position sensor, pickup roller sensor, and ink detection sensor.

If any of these sensor are faulty, an error message or service error code will appear to indicate the faulty sensor.

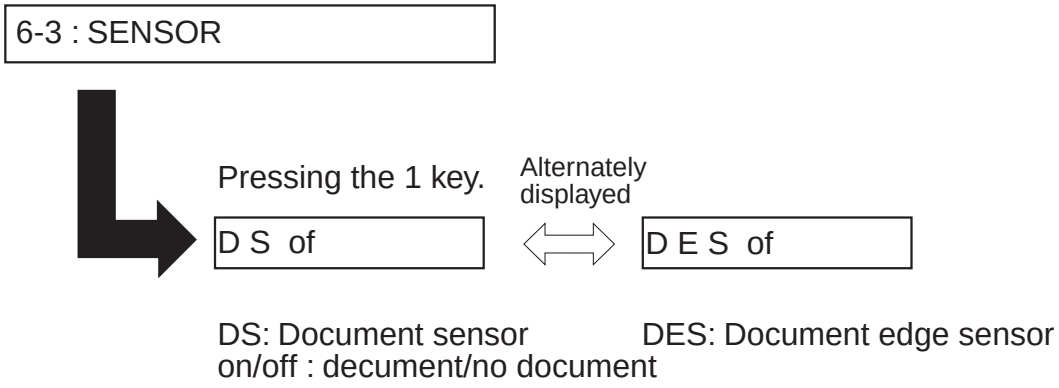


Figure 3-25 Sensor Tests

b) Operation panel tests

The operation panel test is selected by pressing the **7** button from the faculty test menu. In this test, check that the display, LED lamps, and buttons on the control panel are operating correctly.

b-1) Display test

Pressing the **Start/Scan** button from the control panel menu, **"H"** is displayed 16 characters by 1 line on the display. The next time the **Start/Scan** button is pressed, all the LCD dots on the display are displayed. Check for any LCD dots in the display that are not displayed.

b-2) LED lamp test

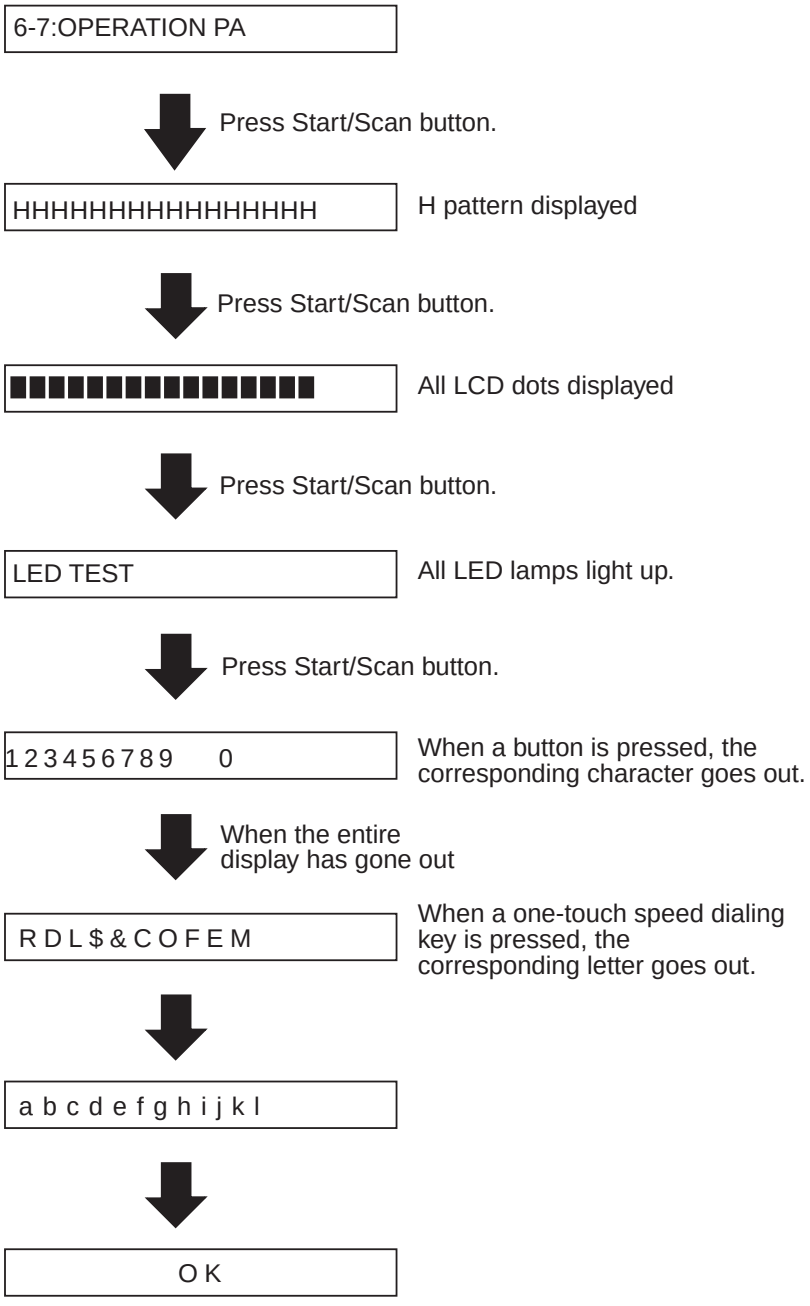
The LED lamp test is selected by pressing the **Start/Scan** button after the display test.
When the **Start/Scan** button is pressed, all the lamps on the control panel light. Check for any LED that does not light during the test.

b-3) Operation button test

The Operation button test is selected by pressing the **Start/Scan** button after the LED lamp test.
In this test, you press the button corresponding to the displayed character to put it out. The table giving the correspondence between the characters and the buttons is below.

Character	Operation button
1-#	Numeric buttons
R	Redial/Pause button
D	Coded dial button
L	Color/B&W button
$	Resolution button
&	Receive Mode button
C	Copy button
O	Hook button
F	Function button
E	Set button
M	Resume button

When all the characters displayed have gone out, the system next starts the one-touch speed dialing button test. The letters a-l are displayed on the display, corresponding to one-touch speed dialing buttons 01-12. Each letter displayed on the display goes out when its corresponding one-touch speed dialing button is pressed.
In this test, check for operation buttons whose corresponding character or letter does not go out when the button is pressed.


6-7:OPERATION PA
Press Start/Scan button.
HHHHHHHHHHHHHHHH
H pattern displayed
Press Start/Scan button.
All LCD dots displayed
Press Start/Scan button.
LED TEST
All LED lamps light up.
Press Start/Scan button.
1 2 3 4 5 6 7 8 9 0
When a button is pressed, the corresponding character goes out.
When the entire display has gone out
R D L $ & C O F E M
When a one-touch speed dialing key is pressed, the corresponding letter goes out.
a b c d e f g h i j k l
O K

Press the STOP button to end the test.

Figure 3-26 Operation Panel

c) Line signal reception test

The line detect test menu is selected by pressing the **9** button from the faculty test menu. This test checks the operation of the NCU signal sensor and frequency counter. In Menu 1, the CI, status can be detected and in Menu 2 the frequency can be detected at changing detection levels. In this way, you can check if the NCU board is correctly detecting signals.

c-1) Test Menu 1

Test Menu 1 is selected by pressing the **1** button from the Line Detect menu. When CI, and CNG are detected from the modular jack, the display changes from OFF to ON and the received frequency is displayed.

c-2) Test Menu 2

Test Menu 2 is selected by pressing the **2** button from the Line Detect menu. When a tonal frequency is detected from the modular jack, the display changes from OFF to ON and the received frequency is displayed. The frequency detection level can be set with the numeric buttons.

Numeric button	Detection level (dBm)
0	–26
1	–30
2	–32
3	–35
4	–38
5	–41
6	–43
7	–45
8	–47
9	–51

c-3) Test Menu 3

Test Menu 3 is selected by pressing the **3** button from the Line Detect menu. When CNG is detected from the modular jack, the display changes from OFF to ON.

c-4) Test Menu 4

This item is not used. Do not select it.

7. SERVICE REPORT

7.1 Report Output Function

7.1.1 User report output functions

The fax can output user reports manually by user operation, or automatically, according to user data settings.

a) Manual output of reports by user operation

Report type	Operations
SPEED DIAL LIST	
One-touch dial list	Press **Function** button, press **Report** button, then select the report type, and press **Set** button.
Document memory list	
Activity Report	

b) Reports output automatically by user data settings

Each report written below can be automatically output by specifying **"REPORT SETTINGS"** in user data.

Transmission (TX) reports
- Error TX report
- TX report
- TX report with first page

Reception (RX) reports
- Error RX report
- RX report

Multi-Transaction (TX/RX) report

Activity report

NOTE

ROM Version display

The ROM version is printed on the top left hand side of the User's data list. Please refer to this when troubleshooting.

example:

USA XX-XX / X.XX

- XX-XX: MAIN-ROM-version
- X.XX: Printer ROM version

c) Reports output automatically

Memory clear report

The fax automatically outputs a memory clear report when the power is turned on after a power cut.

06/17/1999 13:13 FAX 1234567890 Canon Inc. ☑001

****
*** MEMORY CLEAR REPORT ***
****

MEMORY FILES DELETED

TX/RX NO	MODE	CONNECTION TEL/ID	PGS.	SET TIME
0008	B'CAST	[01]Canon UK	1	06/17 13:08
		[02]Canon France		
		[03]Canon USA		
0009	TRANSMIT	[03]Canon USA	2	06/17 13:09
5002	AUTO RX COL	0123456789	1	06/17 13:11

Figure 3-27 Memory Clear List

TX/RX NO	: Indicates four digits of the transaction number
MODE	: Indicates, TRANSMIT, or AUTO RX or B'CAST (Broadcast) and COL (Color)
CONNECTION TEL	: Number sent from the other party or number dialled
PAGES	: Number of pages are stored in memory
SET TIME	: Time when data is stored in memory

7.1.2 Service report output functions

The fax outputs service data setting status, past communications history reports.

a) List of service reports

The fax outputs the service reports shown below.

Report type	Operations
1. System data list 2. System dump list 3. System data list & System dump list	In the service mode, press the **Report** button then select the report type, and press the Set button.
Service activity report (with service error code and dump list)	If you set bits 0 and 1 of #1 SSSW SW01 in the service mode, the service error code and dump list are indicated on the activity report (sending/receiving).

a-1) System data list

This list shows service data #1~#5, #7, #9 setting statuses.

The following is a sumple list for the MultiPASS C560. (The list for the MultiPASS C530 does not contain V.8/V.34-related items.)

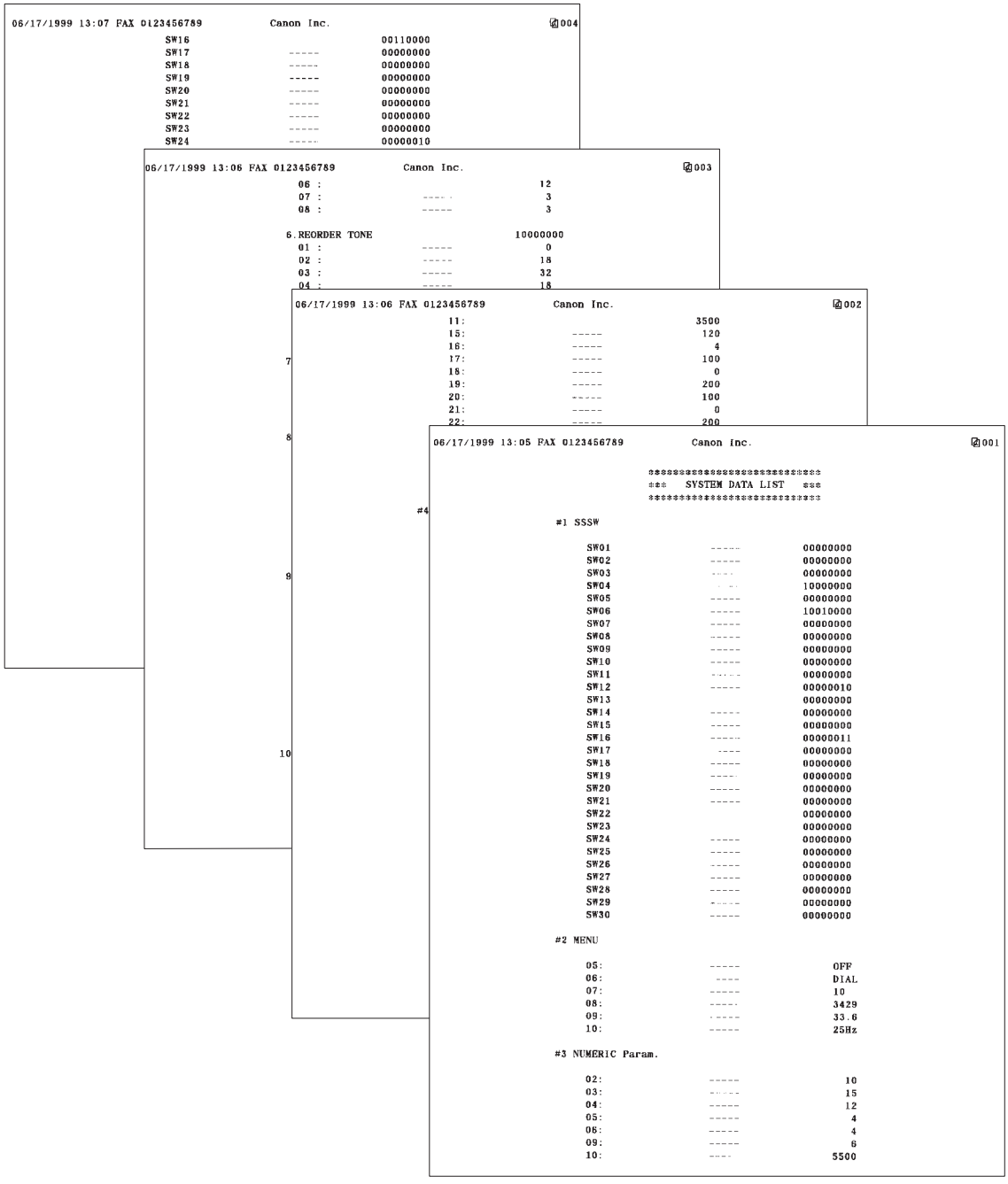


Figure 3-28 System Data List (page 1 ~ page 4)

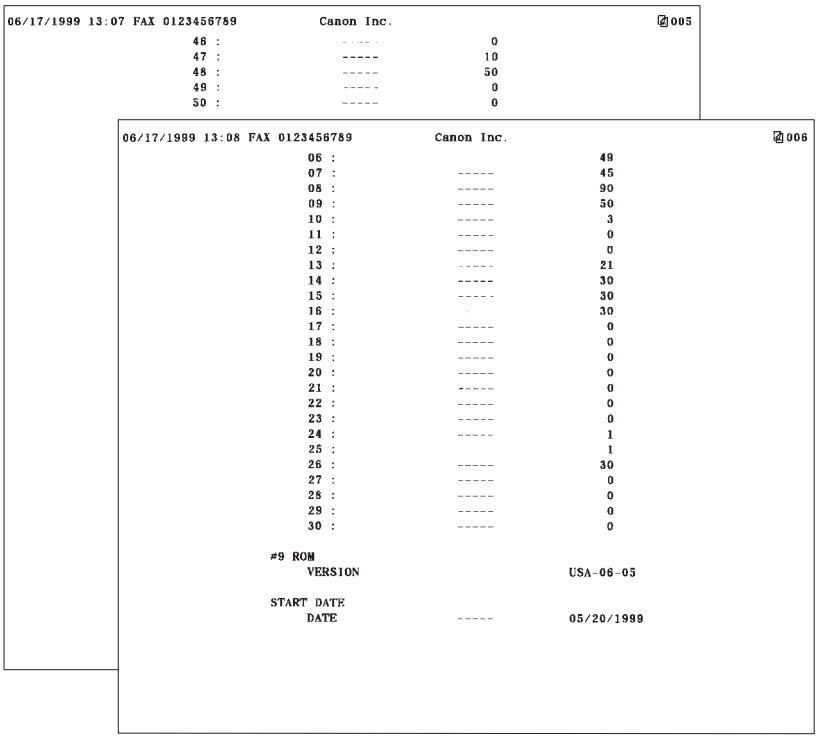


Figure 3-29 System Data List (page 5 ~ page 6)

NOTE

"START DATE" records the date when the fax performs its first transmission, after shipment from the factory.

a-2) System dump list

This list shows the past communications statuses and error communications history.

The following is a sample list for the MultiPASS C560. (The list for the MultiPASS C530 does not contain V.8/V.34-related items.)

```
06/17/1999 13:15 FAX 0123456789          Canon Inc.                          001


      CLEAR DATE                 06/03/1999

      TX    =      1
      A4    =      1    B4    =      0    A3    =      0
      RX    =      7
      A4    =      8    B4    =      0    A3    =      0    LTR   =      0    LGL   =      0
      33600 =      0    31200 =      0    28800 =      0    26400 =      0    24000 =      0
      21600 =      0    19200 =      0    16800 =      0    14400 =      0    12000 =      0
      9600  =      0    7200  =      0    4800  =      0    2400  =      0
      14400 =      7    12000 =      1    TC9600=      0    TC7200=      0
      14400 =      0    12000 =      0
      9600  =      0    7200  =      0    4800  =      0    2400  =      1
      STD   =      4    FINE  =      5    SUPER =      0    ULTRA =      0
      MH    =      0    MR    =      0    MMR   =      0    JBIG  =      6    JPEG  =      3
      G3    =      0    ECM   =      9
      PRINT =     83 /    83              READ  =     44 /    44
      INK ABSORBER CAPACITY
      SUCTION  =     0%


    #000            0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0      0      0

    ##100           0      0      0      0      0      0      4      0
                    0      0      0      0      0      0      0      0
                    0

    ##200           0      0      0      0      0      0

    ##220           0      0      0      0      0      0      0      0
                    0      0      0      0      0      0      0      0
                    0      0      0      0

    ##280           0      0      0      0      0      0      0      0
                    0      0      0      0      0
```

Figure 3-30 System Dump List (1/2)

CLEAR DATE : Date on which data was initialized with service data #8 CLEAR, ALL

RX/TX : Total number of receptions/transmissions

A4/B4/A3/LTR/LGL : Total number of pages transmitted and received for each document size

33600 bps(C560)/14400 bps (C530)~2400 bps : Total number of pages transmitted and received for each modem speed

STD/FINE/SUPER/ULTRA : Total number of pages transmitted and received for each mode

MH/MR/MMR/JBIG/JPEG : Total number of pages transmitted and received for each coding method

G3/ECM : Total number of pages transmitted and received in each mode

PRINT/READ : Total number of pages printed/scanned

[Display example]

PRINT = 30*/100** READ = 30*/100**

* Indicates the value input with Service Data #8 CLEAR, COUNTER.

** Indicates the value counted since shipment from the factory.

INK ABSORBER CAPACITY : Waste ink absorber's ink absorption amount

[Display example]

Suction = 10%

These indicate the following:

The suction waste ink absorber's ink absorption amount is 10%.

#000~##750

[Display example] : Total number of occurrences for each error code

##280	1	7	3	0	0
	##280 errors	##281 errors	##282 errors		

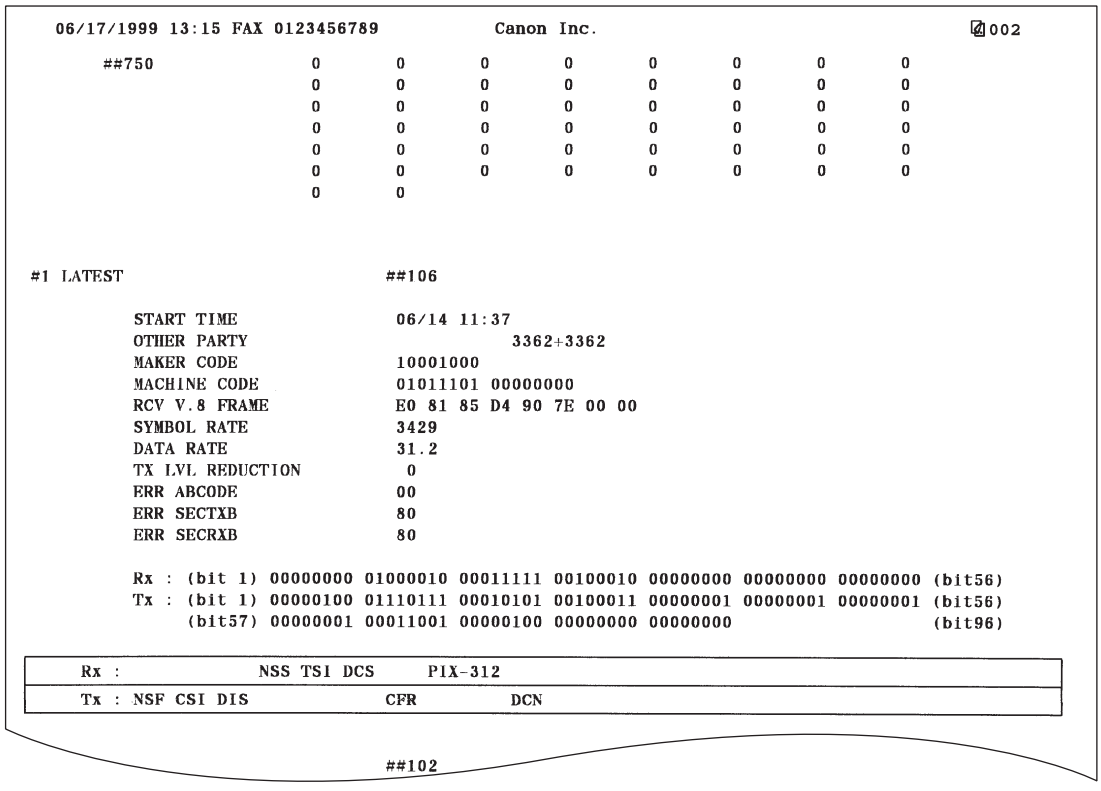


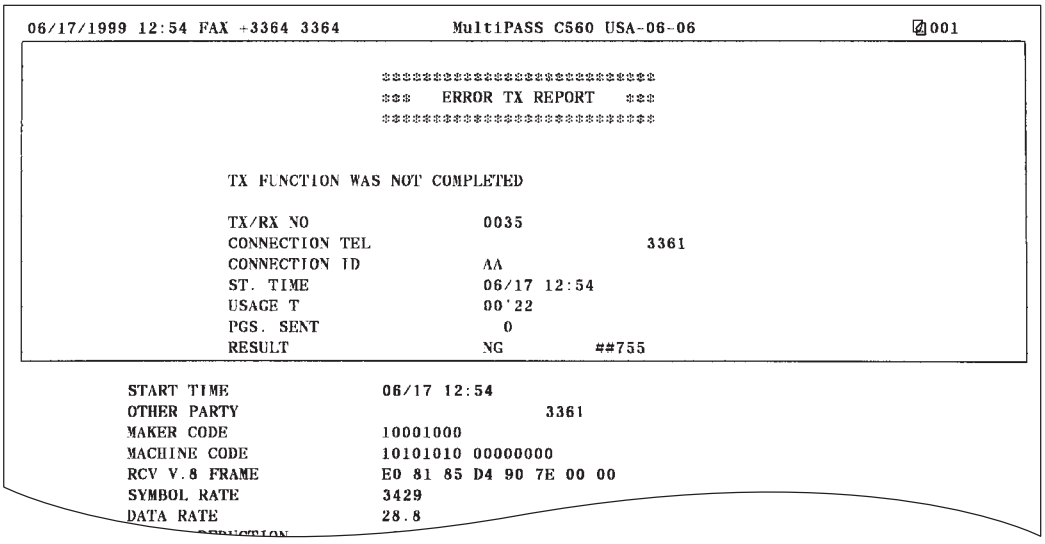
Figure 3-31 System Dump List (2/2)

##nnn	: Service error code
START TIME	: Communication start date and time (on 24 hour clock)
OTHER PARTY	: Telephone number sent from other party
MAKER CODE	: Maker code (For details, *see Chapter 4: MAKER-CODE on page 4-7)* [1000 1000] Indicates a Canon fax lower nibble upper nibble
RCV V.8 FRAME	: Received V.8 protocol signal
SYMBOL RATE	: Symbol rate used for the primary channel
TX LVL REDUCTION	: 0 (Fixed)
ERR ABCODE	: Code output by the modem when an error occurred (Not used in the field)
ERR SECTXB	: Transmit status of the modem when an error occurred (Not used in the field)
ERR SECRXB	: Received status of the modem when an error occurred (Not used in the field)
RX/TX	: Received/transmitted protocol signal bit 1 to bit 96 of received/transmitted DIS, DCS, or DTS

NOTE

If no service errors have occurred in the past, the above report will not be output.

a-3) Service activity report (sending/receiving)



06/17/1999 12:54 FAX +3364 3364 MultiPASS C560 USA-06-06 001

****
*** ERROR TX REPORT ***
****

TX FUNCTION WAS NOT COMPLETED

TX/RX NO	0035
CONNECTION TEL	3361
CONNECTION ID	AA
ST. TIME	06/17 12:54
USAGE T	00'22
PGS. SENT	0
RESULT	NG ##755

START TIME	06/17 12:54
OTHER PARTY	3361
MAKER CODE	10001000
MACHINE CODE	10101010 00000000
RCV V.8 FRAME	E0 81 85 D4 90 7E 00 00
SYMBOL RATE	3429
DATA RATE	28.8

Figure 3-32 Service Error Tx Report

Header : OK, NG messages
TX/RX NO : Indicates four digits of the transaction number
CONNECTION TEL (OTHER PARTY) : Number sent from the other party or number dialled (lower 20 digits)
SUBADDRESS : Subaddress number sent from the other party
CONNECTION ID : ID sent from the other party, if the other party is a Canon fax
START TIME : Communication start date and time (on 24-hour display)
USAGE TIME : Communication time (in minutes and seconds)
PAGES : Number of pages for which transmission was complete
(For details, *see User's manual*)
RESULT : **"NG"** display with number of pages for which transmission was fault, and service error code
MAKER CODE : Maker code (For details, *see Chapter 4: 4. MAKER-CODE on page 4-7)*
[1000 1000] Indicates a Canon fax
lower nibble
upper nibble
RCV V.8 FRAME : Received V.8 protocol signal
SYMBOL RATE : Symbol rate used for the primary channel
TX LVL REDUCTION : 0 (Fixed)
ERR ABCODE : Code output by the modem when an error occurred (Not used in the field)
ERR SECTXB : Transmit status of the modem when an error occurred (Not used in the field)
ERR SECRXB : Received status of the modem when an error occurred (Not used in the field)
RX/TX : Received/transmitted protocol signal
bit 1 to bit 96 of received/transmitted DIS, DCS, or DTS

NOTE

The V.8/V.34-related items (RCV V.8 FRAME to ERR SECRXB) are not printed on the Notmal G3 Service Activity Report.

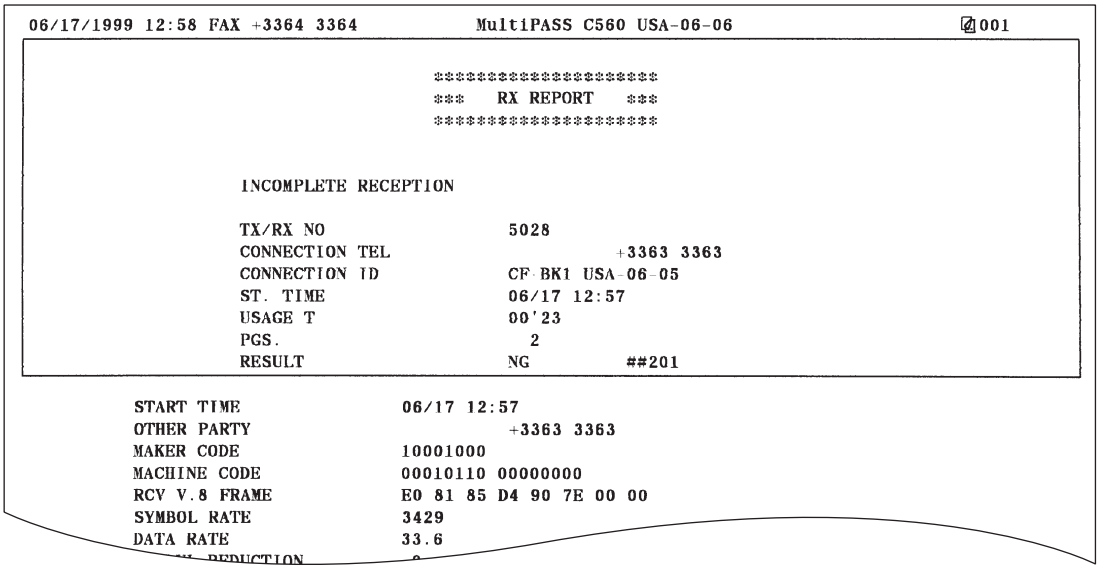


Figure 3-33 Service Error Activity Report (receiving)

Header	:	OK, NG messages
TX/RX NO	:	Indicates four digits of the transaction number
CONNECTION TEL (OTHER PARTY)	:	Number sent from the other party or number dialled (lower 20 digits)
SUBADDRESS	:	Subaddress number sent from the other party
CONNECTION ID	:	ID sent from the other party, if the other party is a Canon fax
START TIME	:	Communication start date time (on 24-hour display)
USAGE TIME	:	Communication time (in minutes and seconds)
PAGES	:	Number of pages for which transmission was complete (For details, *see User's manual*)
RESULT	:	**"NG"** display with number of pages for which transmission was fault, and service error code
MAKER CODE	:	Maker code (For details, *see Chapter 4: 4. MAKER-CODE on page 4-7)*

[1000 1000] Indicates a Canon fax
lower nibble
upper nibble

RCV V.8 FRAME	:	Received V.8 protocol signal
SYMBOL RATE	:	Symbol rate used for the primary channel
DATA RATE	:	Transmission speed used for the primary channel
TX LVL REDUCTION	:	0 (Fixed)
ERR ABCODE	:	Code output by the modem when an error occurred (Not used in the field)
ERR SECTXB	:	Transmit status of the modem when an error occurred (Not used in the field)
ERR SECRXB	:	Receive status of the modem when an error occurred (Not used in the field)
RX/TX	:	Received/transmitted protocol signal bit 1 to bit 96 of received/transmitted DIS, DCS, or DTS

NOTE

The V.8/V.34-related items (RCV V.8 FRAME to ERR SECRXB) are not printed on the Normal G3 Service Activity Report.

8. WIRING DIAGRAM

8.1 Wiring Diagram

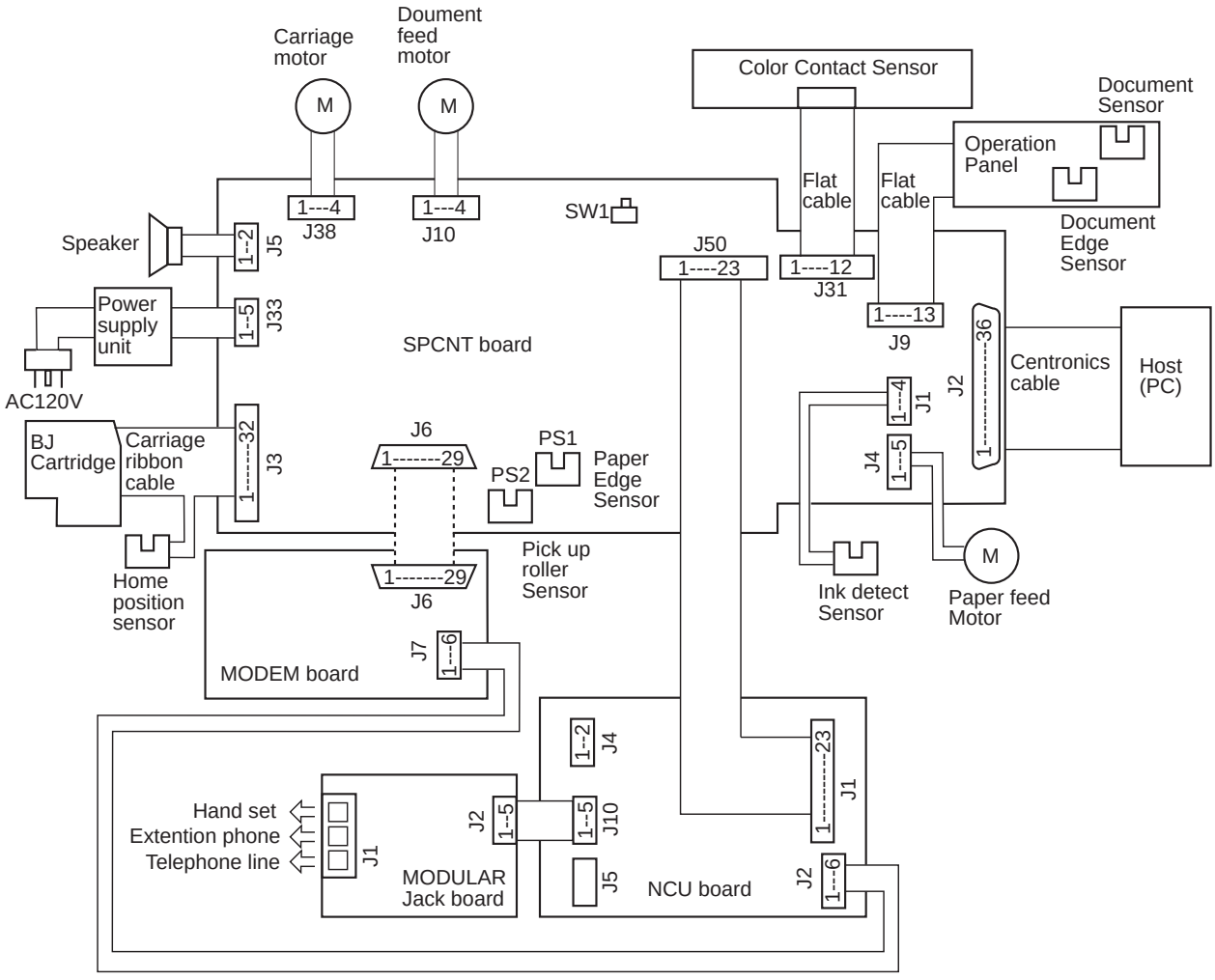


Figure 3-34 Wiring Diagram

8.2 Connector Locations and Signal Descriptions

SCNT board (J1) ← → Ink detect sensor

J1		sensor	Signal name	Description
1	→	—	VZAN	Sensor drive signal
2	←	—	PTR	Sensor output signal
3	→	—	VLED	Sensor LED drive voltage
4	—	—	DGND	Ground

SPCNT board (J2) ← → to Host parallel interface

J2		Host	Signal name	Description
1	—	—	STB*	STROBE*1
2	—	—	DATA0	Data bus
3	—	—	DATA1	Data bus
4	—	—	DATA2	Data bus
5	—	—	DATA3	Data bus
6	—	—	DATA4	Data bus
7	—	—	DATA5	Data bus
8	—	—	DATA6	Data bus
9	—	—	DATA7	Data bus
10	—	—	ACK*	*2
11	—	—	BUSY	*3
12	—	—	PERR	P.E.*4
13	—	—	SELECT	SELECT*5
14	—	—	ATFD*	AUTO FEED XT*6
15	—	—	DGND	Ground
16	—	—	DGND	Ground
17	—	—	—	Not used
18	—	—	+5.0V	Power ON signal
19	—	—	GND	STROBE -RET
20	—	—	GND	DATA1 -RET
21	—	—	GND	DATA2 -RET
22	—	—	GND	DATA3 -RET
23	—	—	GND	DATA4 -RET
24	—	—	GND	DATA5 -RET
25	—	—	GND	DATA6 -RET
26	—	—	GND	DATA7 -RET
27	—	—	GND	DATA8 -RET
28	—	—	GND	ACKNLG -RET
29	—	—	GND	BUSY -RET
30	—	—	GND	P.E. -RET
31	—	—	INIT*	*7
32	—	—	FALT*	Printer interrupt signal
33	—	—	GND	Ground
34	—	—	—	Not used
35	—	—	+5.0V*2	Peripheral power
36	—	—	SELECTIN*	-SLCT IN

*1 Data transmission syncronizing signal (Forward direction)
*2 Data transmission syncronizing signal (Reverse direction)
*3 Data reception completion signal (Forward direction)
*4 Data transmission direction change response signal
*5 Extension request response signal
*6 Data reception completion signal (Reverse direction)
*7 Data transmission direction change request signal

SPCNT board (J3) ← → Carriage ribbon cable ass'y

J1			Cable	Signal name	Description
1	—	1	VHG	GND for head drive voltage HVH	
2	—	2	VHG	GND for head drive voltage HVH	
3	→	3	HT0	Driver signal for temperature control heater	
4	←	4	HT1	Driver signal for temperature control heater	
5	→	5	HVH	Head drive voltage	
6	→	6	HVH	Head drive voltage	
7	→	7	W-HT	Driver signal for sub heater	
8	—	8	INKS1	Not used	
9	←	9	TOP	Detection signal for rank resistance	
10	→	10	DIODEA	Head temperature sensor's (diode) anode	
11	←	11	ID0	BJ cartridge detected and recognition signal *(See page 2-21)*	
12	←	12	ID1	BJ cartridge detected and recognition signal *(See page 2-21)*	
13	←	13	INKS2	BJ cartridge detected and recognition signal *(See page 2-21)*	
14	—	14	HVss	GND for logic drive voltage HVDD	
15	→	15	HENB0(Y)	Heat enable	
16	→	16	Even ENB	Even nozzles' heat enable	
17	→	17	HENB1(M)	Heat enable	
18	→	18	HENB3(B)	Heat enable	
19	→	19	Odd ENB	Odd nozzles' heat enable	
20	→	20	BENB0	Block enable signal 0	
21	→	21	BENB1	Block enable signal 1	
22	→	22	BENB2	Block enable signal 2	
23	→	23	HVdd	Logic drive voltage (+5 V)	
24	→	24	HCLOCK	Printing data's transfer signal	
25	→	25	HLATCH	Timing signal for printing data to the latch	
26	→	26	HRES	Latch's reset signal	
27	→	27	HENB2(C)	Heat enable	
28	→	28	HDATA	Printing data	
29	←	29	DIODEK	Head temperature sensor's (diode) cathode	
30	←	30	HPO	Home position sensor signal (H:Home position, L:No home position	
31	—	31	HPG	GND for home position sensor	
32	→	32	HPA	Home position sensor drive voltage	

SPCNT board (J4) ← → Paper feed motor

J4		motor	Signal name	Description
1	→	—	LFB*	Phase -B
2	→	—	LFA*	Phase -A
3	→	—	VM	Motor drive voltage (+24V)
4	→	—	LFA	Phase A
5	→	—	LFB	Phase B

SPCNT board (J5) ← → Speaker

J5		speaker	Signal name	Description
1	→	—	SPV01	Speaker drive
2	→	—	SPV02	Speaker drive

SPCNT board (J6) ← → MODEM board (J6)

J6		J6	Signal name	Description
1	—	1	DGND	Ground
2	—	2	SA5	Address bus
3	—	3	SA4	Address bus
4	—	4	SA3	Address bus
5	—	5	SA2	Address bus
6	—	6	SA1	Address bus
7	—	7	SD7	Data bus
8	—	8	SD6	Data bus
9	—	9	SD5	Data bus
10	—	10	SD4	Data bus
11	—	11	SD3	Data bus
12	—	12	SD2	Data bus
13	—	13	SD1	Data bus
14	—	14	SD0	Data bus
15	→	15	XMODCS	MODEM chip select signal
16	→	16	XIORD	MODEM I/O read signal
17	→	17	XIOWR	MODEM I/O write signal
18	→	18	XMODINT	MODEM interrupt signal
19	→	19	XMODRST	MODEM reset signal
20	→	20	+5V	Logic drive voltage
21	→	21	+3.3V	Logic drive voltage
22	—	2	DGND	Ground
23	—	23	AGND	Ground
24	→	24	+12V	OP amp drive voltage
25	←	25	MONI	Telephone line input signal
26	—	26	AGND	Ground
27	→	27	CNGFC	CNG detection signal
28	→	28	PBLVL	PB level control signal
29	→	29	CMLD	CML relay control signal
30	—	30	N.C.	Not used

SPCNT board (J9) ← → Operation panel unit (J1)

J9		J1	Signal name	Description
1	—	13	DGND	Ground
2	←	12	KI00	Key sense signal
3	←	11	KI01	Key sense signal
4	←	10	KI02	Key sense signal
5	←	9	KI03	Key sense signal
6	←	8	KI04	Key sense signal
7	←	7	KI05	Key sense signal
8	→	6	RS	LCD control signal
9	→	5	SOD	LCD and LED serial data signal
10	→	4	ECLK	LCD write signal
11	→	3	CLK374	Clock signal
12	→	2	+5V	Logic drive voltage
13	→	1	+5V	Logic drive voltage

SPCNT board (J10) ← → Document feed motor

J10		motor	Signal name	Description
1	→	—	RAO	Phase A
2	→	—	RAO*	Phase -A
3	→	—	RBO	Phase B
4	→	—	RBO*	Phase -B

SPCNT board (J31) ← → Contact sensor

J31		CS	Signal name	Description
1	→	—	VLED	IC drive voltage
2	→	—	B LEDGND	Blue LED control signal
3	→	—	G LEDGND	Green LED control signal
4	→	—	R LEDGND	Red LED control signal
5	→	—	CSCLK	Contact sensor enable signal
6	—	—	GND	Frame ground
7	→	—	SH	Line reset signal
8	—	—	GND	Ground
9	—	—	NN	Dark level clamp
10	→	—	CS5V	Logic drive voltage
11	—	—	GND	Ground
12	←	—	VIN	Analog image data

SPCNT board (J33) ← → Power supply unit (CN101)

J33		CN101	Signal name	Description
1	←	1	+3.3V	Logic drive voltage
2	←	2	+5V	Logic drive voltage
3	—	3	GND	Ground
4	←	4	+24V	Motor drive voltage
5	—	5	GND	Ground

SPCNT board (J38) ← → Carriage motor

J1		motor	Signal name	Description
1	→	—	CRA	Phase A
2	→	—	CRA*	Phase -A
3	→	—	CRB	Phase B
4	→	—	CRB*	Phase -B

SPCNT board (J50) ← → NCU board (J1)

J50		J1	Signal name	Description
1	—	23	DGND	Ground
2	←	22	BIT3	for future use
3	←	21	BIT2	for future use
4	←	20	BIT1	for future use
5	—	19	LPL2	Not used
6	—	18	LPL1	Not used
7	—	17	HOOK2	Not used
8	←	16	HOOK1	Off hook detection signal
9	←	15	CIOR	CIOR signal 1
10	←	14	CI2	CI detection signal 2
11	←	13	CI1	CI detection signal 1
12	—	12	LPRD	Not used
13	→	11	DCD	DC relay control signal
14	→	10	CMLD	CML relay control signal
15	→	9	HRD	H relay control signal
16	→	8	PRD	P relay control signal
17	→	7	SRD	S relay control signal
18	—	6	VHGND	Ground
19	—	5	N.C.	Not used
20	→	4	VH	+24V DC
21	→	3	+3.3V	Logic drive voltage
22	→	2	+3.3V	Logic drive voltage
23	—	1	DGND	Ground

MODEM board (J7) ← → NCU board (J2)

J7		J2	Signal name	Description
1	—	6	AGND	Ground
2	→	5	+12VA	Sensor LED drive voltage
3	→	4	+12VA	Sensor LED drive voltage
4	—	3	AIN	Line monitor signal
5	→	2	TX	Telephone line transmision signal
6	←	1	RX	Telephone line reception signal

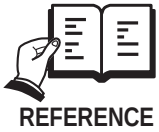
NCU board (J10) ← → Modular board (J2)

J10		J2	Signal name	Description
1	—	5	L1	Line for extension telephone
2	—	4	L2	Line for extension telephone
3	—	3	—	Not used
4	—	2	T11	Telephone line
5	—	1	T12	Telephone line

Modular board (J1) ← → to Extension telephone or Telephone line

J1		EXT. Tel	Signal name	Description
1	—	—	L2	Telephone line
2	—	—	L1	Telephone line
3	—	—	T2	Line for telephone
4	—	—	T1	Line for telephone
5	—	—	CT2	Line for extension telephone
6	—	—	CT1	Line for extension telephone

1. INSTALLATION



This machine has been designed for user installation. Therefore, this manual contains only an outline description of the procedures. For details of the installation, see the *USER'S GUIDE*.

1.1 Setting up

- Choosing a Location for Your MultiPASS
- Do you have everything?
  Check that nothing is missing when the unit is unpacked.
- Removing shipping materials
  Peel off all strips of tape from the unit. Don't forget to remove the protective sheet from the separation roller, in the scanner section.
- Assembling your MultiPASS
  Install the accessories, Document Support, Document Tray, etc.
- Making connections
  Connect the Telephone line, Extension phone or Answering machine or Data Modem, Parallel cable (for PC).
- Powering up
  Connect the power cord and check that power is supplied.
- Installing the BJ cartridge
  Unseal the BJ cartridge, and load it into the machine. The instructions for this operation are written on the printer cover.
- Loading paper
  Set paper in the auto sheet feeder, in **PAPER SIZE** under **PRINTER SETTINGS**, set the size of paper that is to be used.
- Setting the **TEL LINE TYPE**
  Choose the setting the matched the type of line being used.
- Entering user information
  Enter user information, such as **DATE & TIME, UNIT TELEPHONE #, UNIT NAME**.etc.

1.2 Checking Operations

- Copy operation
  Make a copy, and check that the operation is normal.
- Communication test
  Transmit to, and receive from other facsimiles, and check that images are sent normally for transmission, and are printed normally for reception.

What to do when trouble occurs

Very rarely, during use, the display may go out, all the buttons may stop working, or some other trouble may occur because of strong electrical noise or a large amount of static. If such trouble occurs, initialize the RAM. During installation, we recommend that you perform the all clear operation after the power on. Refer to *NOTE: "All clear" when nothing works on Page 1-61.*

2. USER DATA FLOW

2.1 USER DATA FLOW (by Operation Panel)

Press the **Function** button, then press the **Data Registration** button.

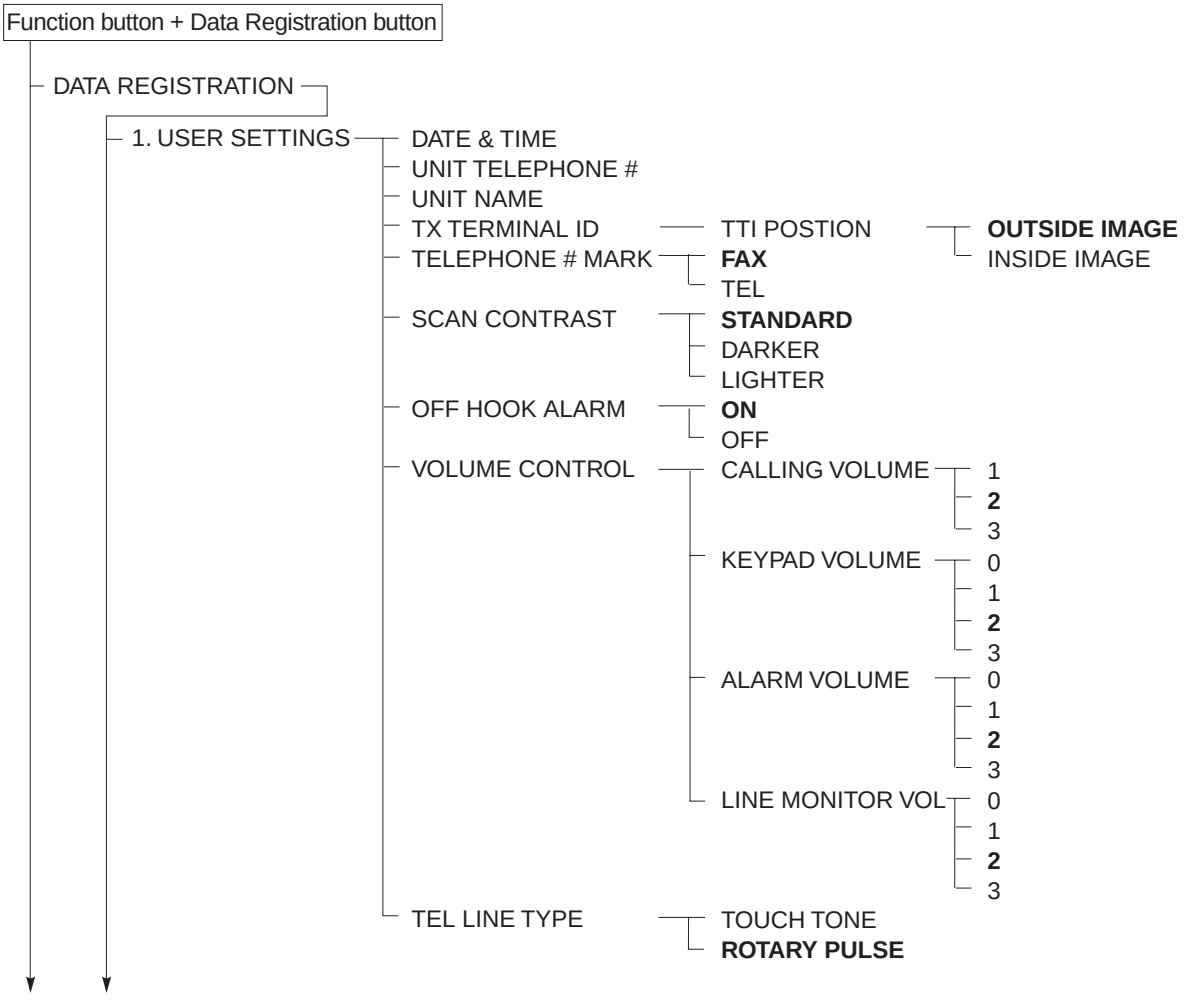


Figure 4-1 User Menu Settings (1/4)

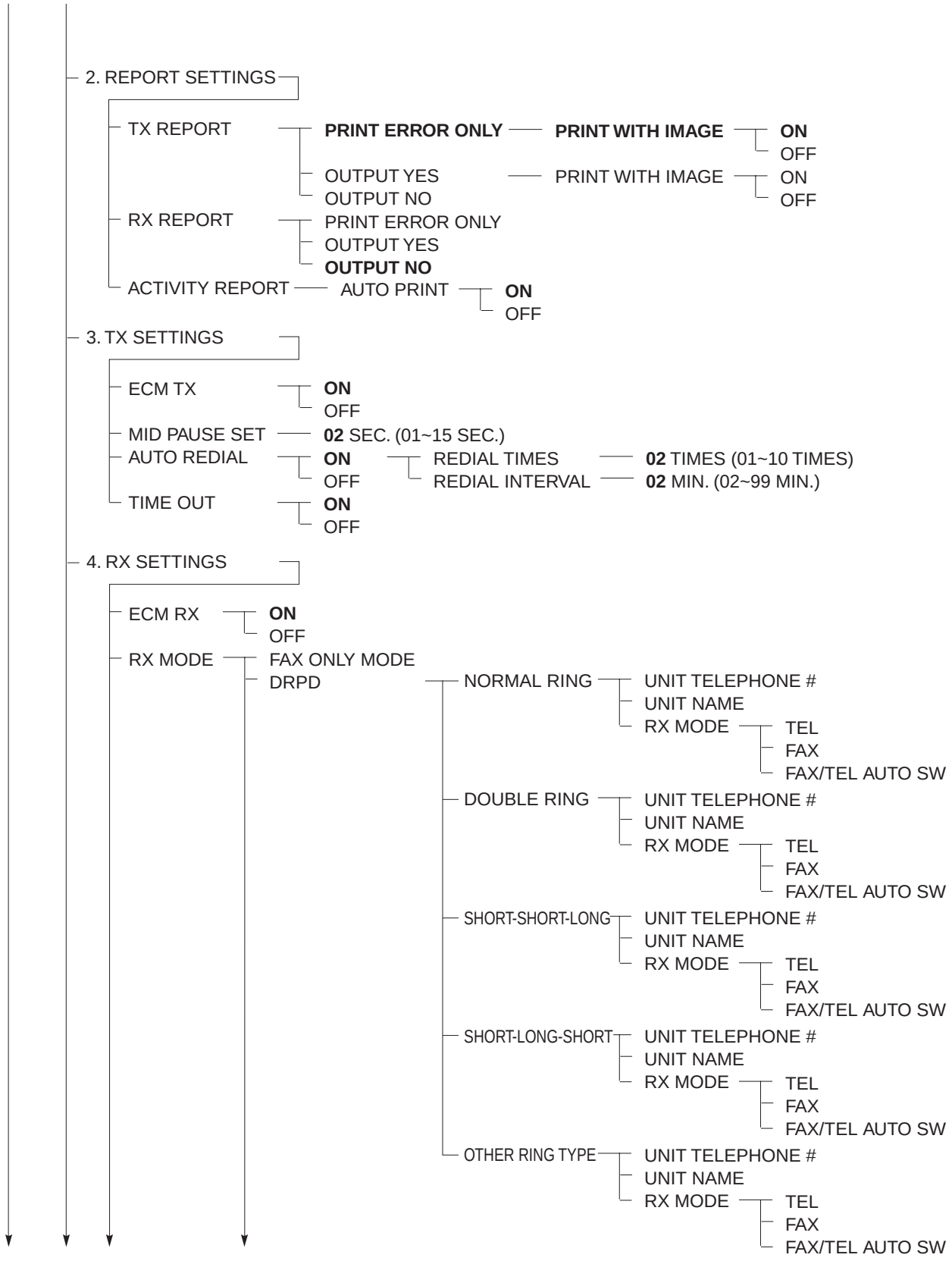


Figure 4-2 User Menu Settings (2/4)

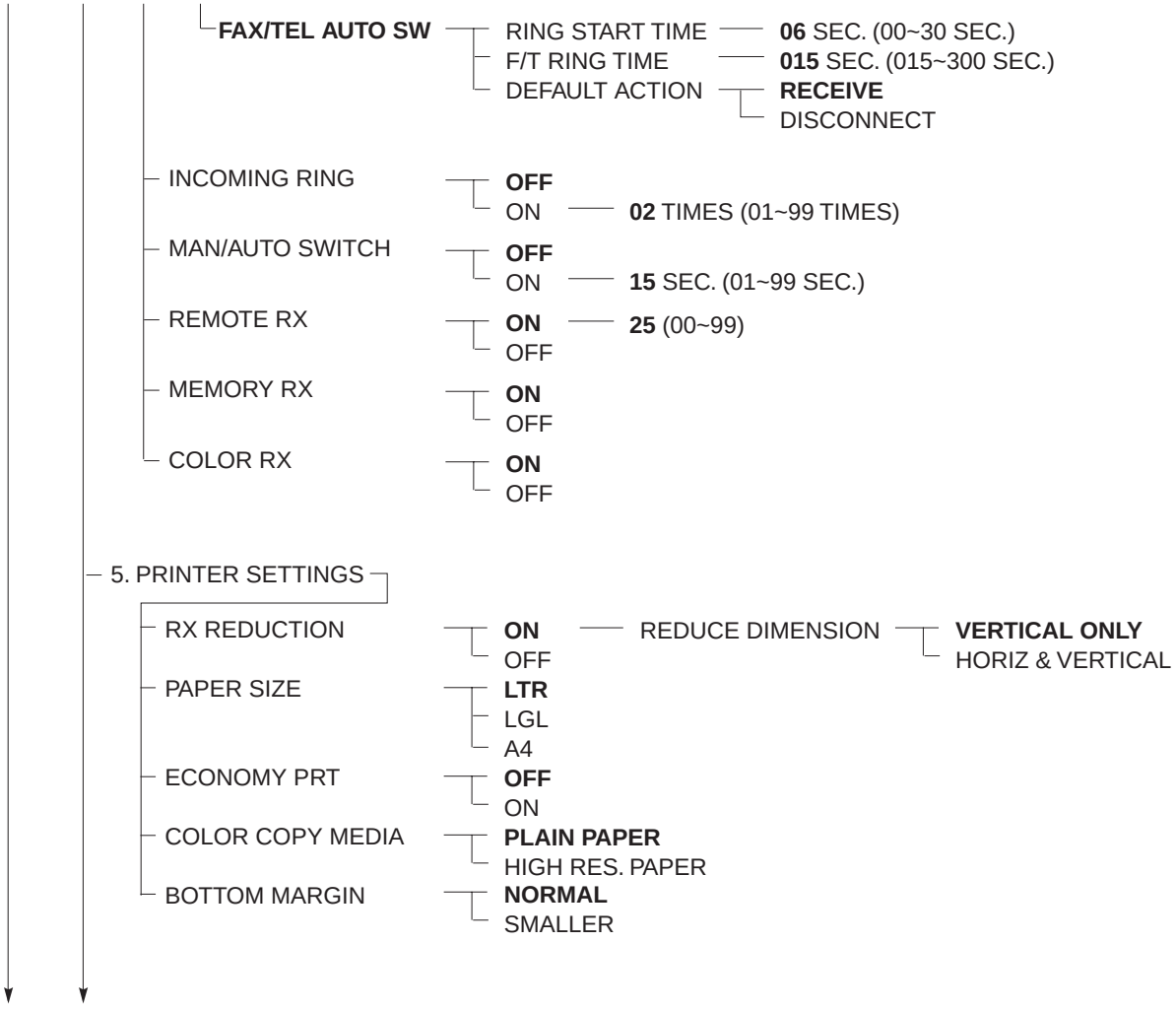


Figure 4-3 User Menu Settings (3/4)

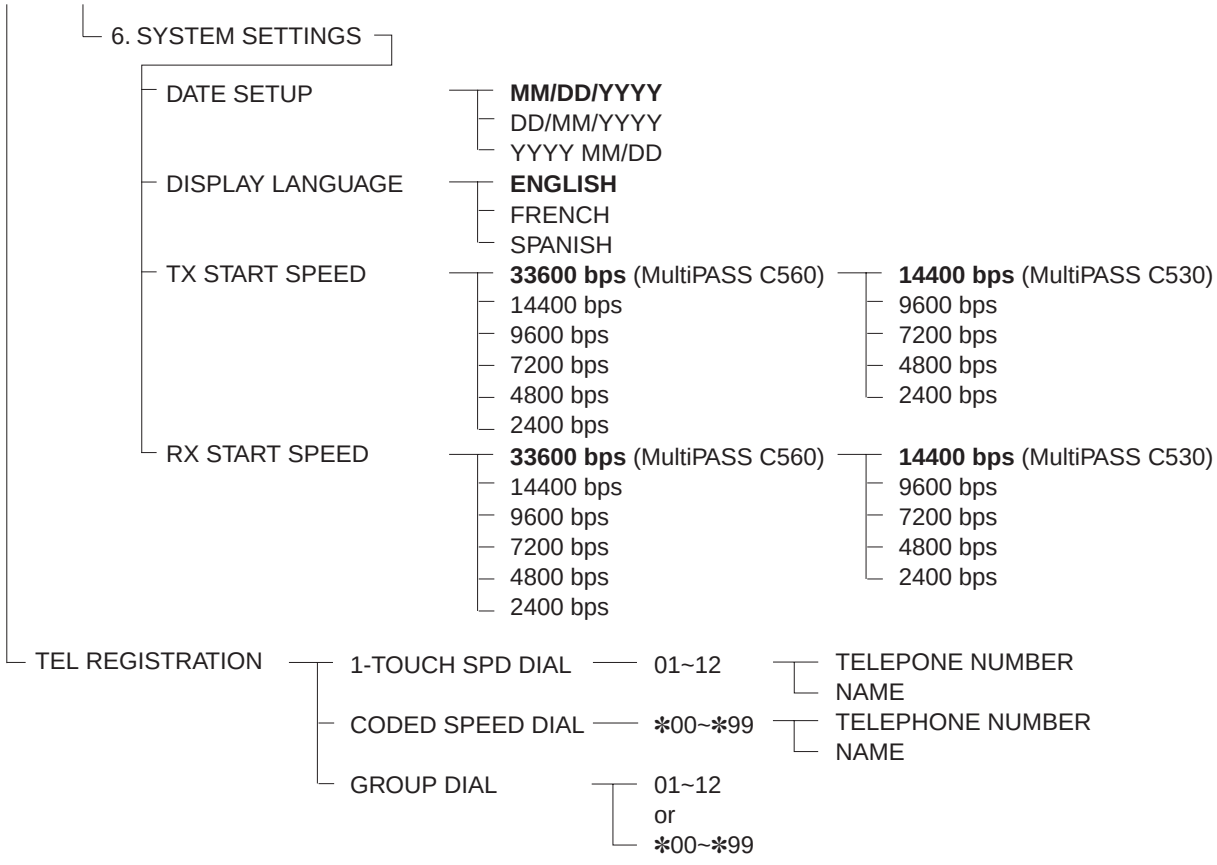


Figure 4-4 User Menu Settings (4/4)

2.2 User Data Flow (by MultiPASS Desktop Manager)

Please see *the MultiPASS Desktop Manager for Windows User's Guide*.

2.2 Memory Reference Function Flow

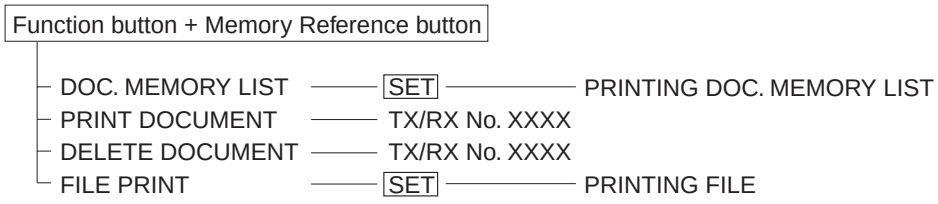


Figure 4-5 Memory Reference Function Flow

3. MAKER-CODE

The 1-byte maker code displayed on the error dump list corresponds to the list of makers shown on the following page.

REFERENCE

For a sample of a dump list containing maker codes, see *pages 3-61 ~ 3-63*.

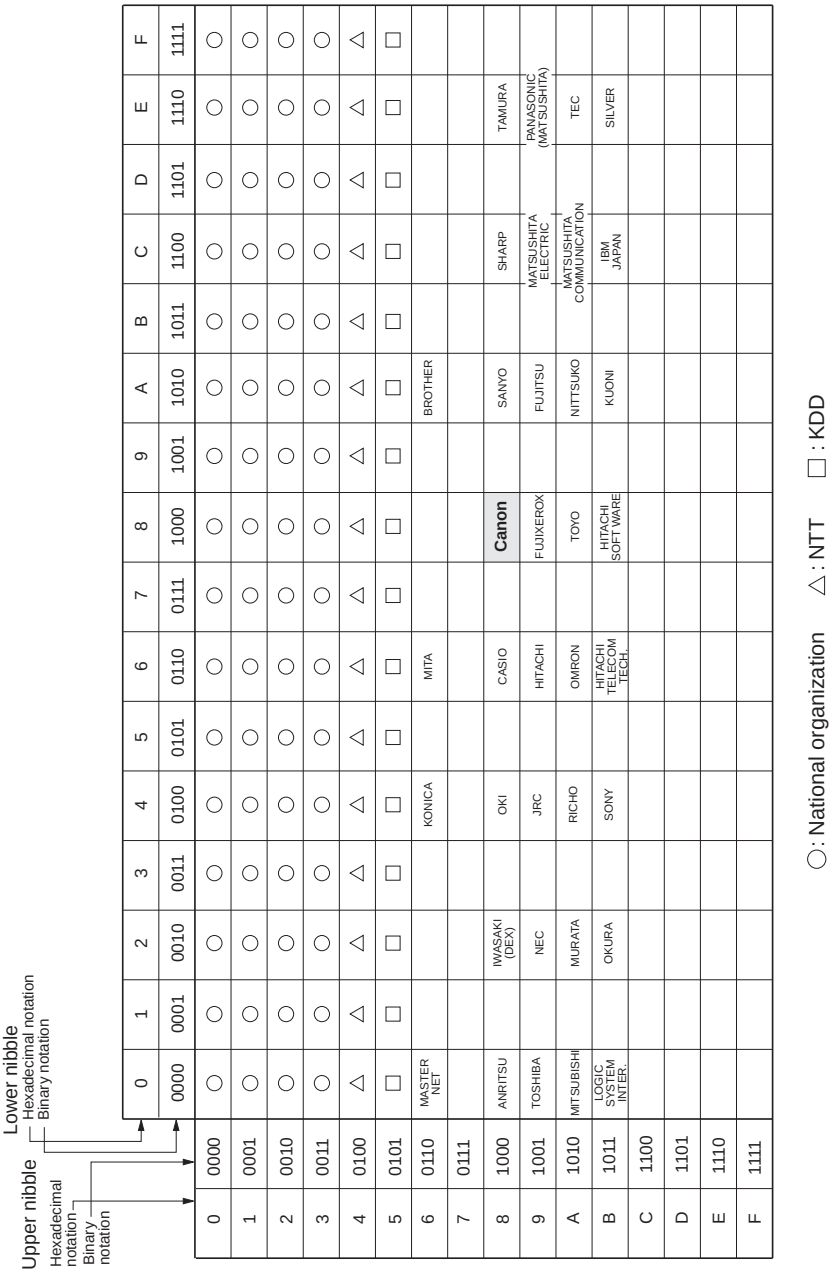


Figure 4-6 Maker Code

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